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REVENUE MANAGEMENT THROUGH REGRESSION ANALYSIS

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Revenue Management through Regression Analysis

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"Of course you want more revenue, but what good is it if it is not predictable?"

- *Aaron Ross*

Revenue Management through Regression Analysis

Abstract

The purpose of this dissertation is to develop a method to define preliminary mathematical models that translate the demand volatility caused by price changes for each SKU of a company. The ultimate goal of the project is to use those models to find out what should be the price of a determined product to the final consumer, distinguishing the different distribution channels, that maximizes profit and/or market share. The company, to whom this project was made for, is a Mexican business present in the personal care and household cleaning market.

Consumers' preferences in general, and willingness to pay in particular, are constantly changing. From the point of view of profit maximization, the price discrimination allows sellers to earn much higher profits as opposed to simply basing all pricing decisions on a certain fixed mark-up above unit cost. In order to achieve an effective pricing strategy, Revenue Management allows understanding and predicting demand to a given price. It can be resumed as a variable pricing strategy that pretends to sell the proper product to the right client for the right price at the right moment. By means of application of Revenue Management practices in terms of data collecting and information audit, demand predictive models were built through regression analysis. This statistical process is a commonly used method to study the relationships among factors in a given system that can help in predicting and determining the demand for a given price. Based on the obtained results, a price strategy to reach the wanted growth for the sales volume of the following year was proposed.

From the over 2000 models created with the most representative SKU and concerning the different groups and formats of the markets, 44 models for the wholesale market and 98 for the retail market were selected as valid.

Acknowledgments

I would like to sincerely thank to my colleagues in Aurigam for all the support, patience, and most importantly, their friendship during this adventure. I would like to acknowledge in particular Gabriel Carrasco, for giving me the opportunity to develop this project in Aurigam and to work by his side. As well, to Ricardo Plaschinski for his guidance and for always trusting me to assume responsibilities and be part of the decisions.

I am also grateful to everyone in FEUP that contributed to the successful conclusion of this project, especially to the Professor José Luís Borges for always being available to help and guide me through this process.

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1. Introduction

This dissertation project in a business environment occurs as an extent of the Integrated Masters of Industrial Engineering and Management. It was held from March to June of 2015 in the company "Aurigam Growth Consulting" based in Mexico City (*Distrito Federal*) and Guadalajara (*Jalisco*), in which this assignment took place. Aurigam is a management consulting company specialized in marketing strategy and sales in several business sectors such as the pharmaceutical industry, travel & leisure, venture capitals and retail & consumption. This firm develops short and mid-term projects to clients, being its core business so far, the design of commercial strategies, branding & market positioning and customer capture and retention. In the specific case of this project, Aurigam provided a service to a Mexican company present in the personal care and household cleaning market (Aurigam Growth Consulting, 2015).

This assignment describes part of the project developed for the client company, and therefore some of the information here presented is confidential. For that matter, the client name will be omitted as well as their products name.

1.1 Problem Description

The purpose of this dissertation is to develop a method to define preliminary mathematical models to measure the demand volatility caused by price changes for each SKU of a company. The ultimate goal of the project presented by Aurigam is finding out what should be the price of a determined product to the final consumer, considering the different distribution channels, in order to maximize profit and/or market share.

Consumers' preferences in general, and willingness to pay in particular, are constantly changing. From the point of view of profit maximization, the price discrimination allows sellers to earn much higher profits as opposed to simply basing all pricing decisions on a certain fixed markup above unit cost. Commonly, such cost-based pricing techniques fail to extract a large part of what consumers actually value the product. The most efficient way of learning about customers and their willingness to pay is by *trial and error* and recording how consumers respond to those price changes (Shy, 2008). Tracking this type of information, allows understanding how the demand reacts to determined variations in price. The resultant models of the application of the suggested methodology, at a later time, will be subject to a factorial experiment. This will allow measuring the real effectiveness of the models by testing

different prices and observing the respective demand reactions. With the recordings of the experiment, the models can be confirmed or, if necessary, adjusted.

From all the databases provided by the client and other relevant information and knowledge gathered by Aurigam through the time, the objective is to organize that data and make it the "groundwork" of the company's pricing strategies. Knowing how sensitive the demand of a product is, allows managing the selling price in a most convenient way.

The goal of this work is to initialize the construction of pricing techniques based on the historical information available and regulate the selling prices according to the distinct distribution channels and market chains.

1.2 Client Description

The client is a privately held company in the industry of the consumer goods that supplies products for personal care and household cleaning, through dynamic and recognizable brands in North and Central-America and Caribbean. Employs more than 600 people and it is committed to making available to the market high quality products and services for a competitive price.

This company always had an important role in the Mexican soaps and detergents market. Today its development is understood as a natural sequence of their own efforts, commitment and teamwork. Its vision is to consolidate an organization of high performance, focused and able to offer a continuously improved service to the collaborators.

1.2.1 Company Organizational Structure

The organizational structure determines how the roles, power and responsibilities are assigned, controlled and coordinated, and how the information flows between the different levels of management. These represent the hierarchical arrangement of lines of authority, communications, rights and duties of an organization (Business Dictionary, 2015).

The client company structure is divided in seven levels as pictured in Figure 1. The levels described can vary depending if it refers to the sales area or to the administration area. In descending order of hierarchy the stages are: General Manager, Department Manager, Manager, Team Leader (sales), Supervisor (administration) / Sales Agent (sales), Assistant and Junior.

Figure 2 shows the main decision agents in the company that report directly to the General Manager.

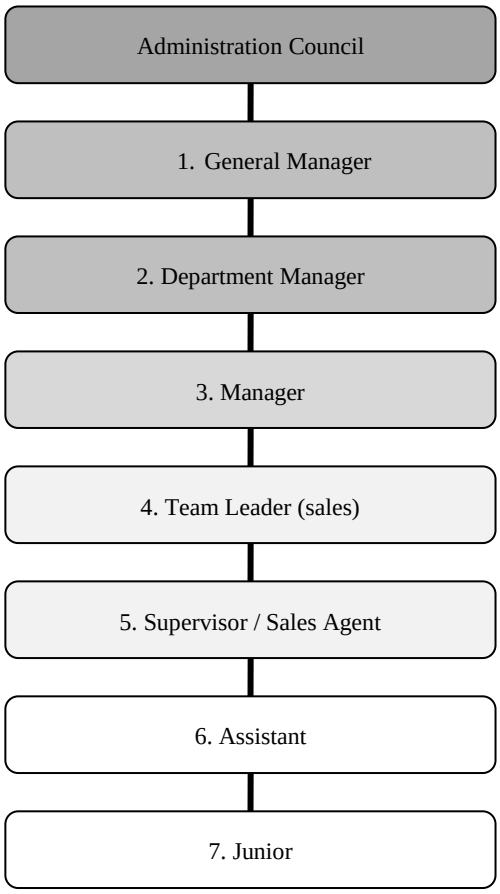

Figure 1 - Client Company's Structure

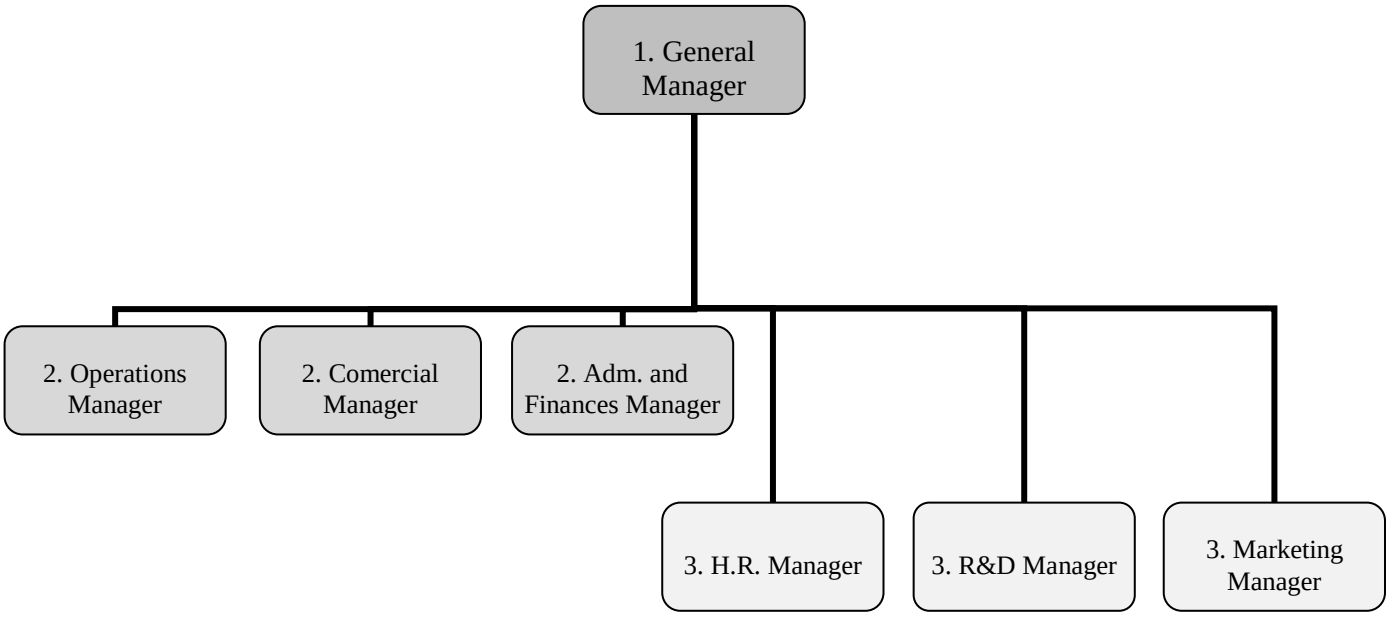

Figure 2 - Client Company's Diagram

1.2.2 The "Road to Market"

The client company has three channels for making its products available to the final customer: retail, wholesale and government. The first includes the big retail markets, convenience stores and "Price Clubs" where there is a great dynamic in terms of price and the negotiations are frequent. Price wars between market chains and segments are recurrent, so the company assigns dedicated managers per group of major retailers in order to run these accounts efficiently. The second channel is rather more "static" than the retail market, where the prices and margins rarely change unexpectedly (exception to the segments with similar behavior with the retail market). Concerning this type of channel, the team leaders of sales are allowed to take minor decisions within the guidelines of the company to manage the relationship with the distributors. Finally, the government is the more static channel from the three. There are only a few price changes throughout the year and the margins are low, as the products are destined to social supply. In this case, the products go to stores owned by the government in the less populated regions of the country and/or with low access to resources. Being a channel with almost no room for negotiations and for recurrent price variations, it is not suitable for projects of revenue management and therefore, will not be considered for this study.

Independently of the distribution channel, the players involved and the margins that each one of them takes must be considered. For that matter, it is compulsory to analyze the distinct channels separately, in order to design a proper price strategy to approach them.

1.3 Project Presentation

In a very competitive market, the understanding of the consumers' behavior acquires an even greater relevance. Revenue Management has as primary aim to sell the right product to the right customer at the right time for the right price and with the right pack (Cross, 1997).

As mentioned before, the project presented by Aurigam aims to find out what should be the price for each SKU of the client company to the final consumer that maximizes profit or increases market share, taking into account the players involved in the process.

In order to accomplish this goal, this project intends to create mathematical models based on the available historical data for each SKU, or group of similar SKU, that are able to predict the price-demand relation, taking into account the distribution channels, the client main competitors and the market trends. Usually, firms can collect data on the demand facing their products by experimenting with different prices and recording the quantity demanded at every price. Having this type of data, it is possible to design a function that represents the

relationship verified between these two variables. The main competitors and market trends variables can be obtained by analyzing external databases that congregate this type of data. Therefore, in order to reach that formula, a regression analysis can be performed to attempt to match the most precise way the market behavior with these equations.

Through these models, the client should be able to understand how the market changes affect directly its business and has the possibility to coordinate its pricing techniques with the historical data. This can be a very powerful tool as it allows the client to know which price ranges permit to increase revenue or market share, gaining an interesting advantage over its competitors.

For this project, Aurigam proposed a sequence of activities over time in order to accomplish the goals set and fulfill the client expectations. The list of activities and expected duration time is found in the Table 1. A few of these activities occur simultaneously or are overlapped in some occasion, as the Gantt diagram in the Annex A: Gantt Diagram of the Activities shows.

1.4 Report Organization

The report is divided into five major chapters: Introduction, General Context, Revenue Management, Methodology & Solution and Results & Conclusions. This sequence helps to contextualize the problem and the methodology used to approach the problem in the interest of finding the best solution.

The first chapter, "Introduction" briefly explains the context of this work, gives a general description of the company to whom this project was made for as well as its general organizational structure. The problem in the origin of all of this process is presented.

In "Market Segments" is given an overview of the state of the market for products for personal care and household cleaning and for the consumer goods industry in Mexico. This chapter is justified by the need to understand the context of the consumption in order to acquire some business sensitivity to interpret the best way possible the results obtained.

The following chapter introduces the background of the solution for the presented problem. It explains in what "Revenue Management" consists, how an application of analytics to predict demand can be useful to companies and the general guidelines to develop a project of this matter.

"Methodology & Solution" unveils the methodology used and the mathematical approach for this project, including a generic explanation of the mathematical models achieved by the

correlation analysis and how can they be understood. In addition, the application process of these equations is described and how the results should be perceived.

In the final section, the results obtained with the process descripted in the previous chapter are presented and judge by their business sense. The market knowledge here is essential to validate the outcome of the mathematical study and make the necessary adjustments to the equations. Also covers the main conclusions taken from this effort and how this project will proceed hereafter

Table 1 - List of activities and expected duration time

LIST OF ACTIVITIES	EXPECTED DURATION TIME (working days)
Distribution Channels Management Analysis	10
Market Behavior Analysis	13
Ideal Channel Mix Proposal	5
Commercial Policies Diagnosis	10
Commercial Policies Proposal	18
Information Requirement	20
Information Analysis (Quality & Quantity)	10
Mathematical Models Construction and Validation	30
Training and Transferring of Information (part 1)	10
Price Strategy Proposal	15
Implementation Plan	30
Training and Transferring of Information (part 2)	30

2. Market Segments

This chapter presents a general view of the consumer goods market in Mexico, covering mainly the two different product segments where the clients' company has its core business: Toilet Soap and Multipurpose Detergent. The importance of this chapter comes from the necessity to understand the segments of the market where the company is embedded and to interpret critically the final results given by the models. Knowing the overall state and tendencies will influence the decision process of whether accept or refuse the price drop/ rise.

2.1 Consumer goods market

The state of the consumer goods market can be measured by taking into account the concept of "basket of goods". Basket of goods is a relatively fixed set of consumer products and services valued and used on an annual basis to track inflation in a specific market or country. It contains everyday products such as food, clothing, furniture and financial services. The goods in the basket are adjusted periodically to account for changes in consumer habits and it is used primarily to calculate the Consumer Price Index (CPI). The CPI compares the value of the basket each year and determines the level of inflation for that period (Investopedia, 2015).

Figure 3 shows the variation in percentage in terms of sales volume, sales value and price, for a basket of goods and its different product families in the trimester November 2014-January 2015 compared with the same period in the previous 12 months.

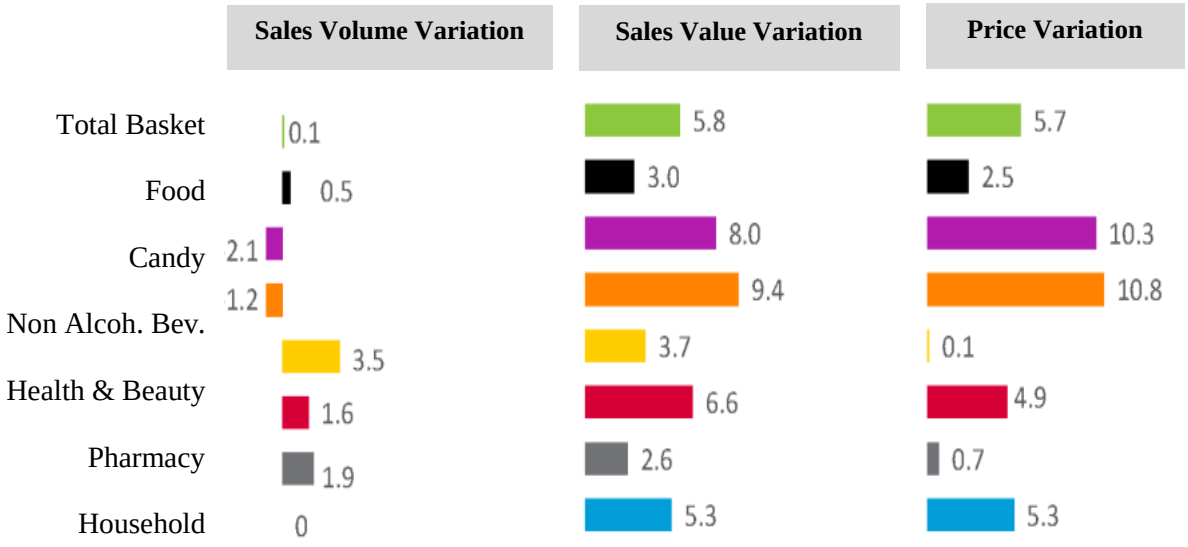

Figure 3 - Basket of goods sales and price variation Nov13-Jan14 vs Nov14-Jan15, Source: Nielsen

Observing the graphic, in that period there was a 0.1% growth considering volume of sales of a total basket of goods, as well as a 5.8% and a 5.7% increment in sales value and price, respectively. Part of the increments registered in the sales value and price could be a consequence of the inflation verified in the country. Mexico finished the year of 2014 with an inflation of 4.08% (Banco de México, 2015). "Candy" and "Non Alcoholic Beverages" behaved distinctly to the other product families, showing a reduction in the volume of sales but an increase of their value. This is a consequence, in part, of the implementation of taxes in Mexico in sodas or liquid candies along with a ban on the advertisement of this kind of products during the television broadcasting of programs dedicated to children (Rodríguez, 2014). In the context of the market of personal care products and household cleaning, the numbers of "Health & Beauty" and "Household" families have more relevance. In the first mentioned, there is a sales growth with the price relatively unchanged, generating a bigger monetary value. The "Household" family also had a positive variation of the average price causing a growth of 2.6% in value of sales over a 1.9% boost in sales volume. The following two sub-chapters describe more in detail the behavior of the market in these key families.

2.2 The "Health & Beauty" market

Being toilet soap products a main source of revenue for the company, it is essential to be aware of how the health and beauty market is behaving. Considering this specific category, Figure 4 shows the sales volume and price variation (2013 vs 2014) in percentage of each one of these products within this family.

Figure 4 tells that the majority of products from this family had its price raised, comparing the same periods of 2013 and 2014, with the exception of brushes, deodorants, handkerchiefs and incontinence protectors. "Batteries" is the type of product that had the most reduction in the sales volume, decreasing 16% against the numbers of the year 2013 and 9% comparing just the bimester November – December. On the other hand, "Deodorants", "Diapers" and "Incontinence Protectors" recorded the biggest positive variations in terms of sales volume, taking into consideration that just in the case of the first mentioned there was a price reduction (1%). In the context of this project, the type of product that assumes more relevance in this family is "Toilet Soaps". For this kind of soaps there was a 2% drop in the sales volume comparing the last two months of the calendar year with a 7% price increase, and parity in the volume of 2014 in contrast to the previous year.

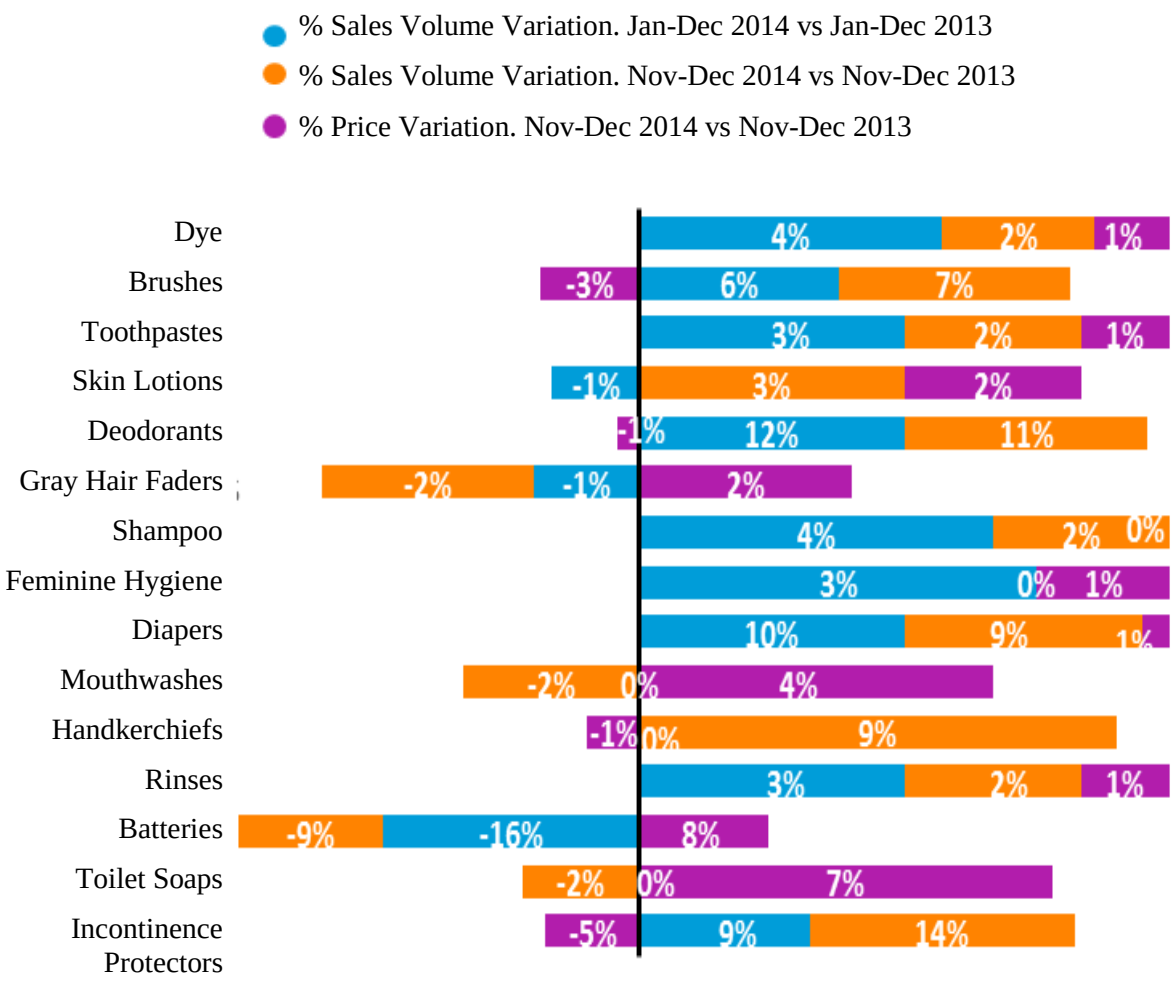

Figure 4 - Sales volume and price variation in the health and beauty market, Source: Nielsen

Nowadays in Mexico, the national industry of toilet soaps provides almost 100% of the domestic market through a wide range of formats, types, varieties and brands (INAES, 2000). This particular market is described next.

The "Toilet Soaps" market

From familiar organizations with a regional range, this industry developed into a market formed by national covering Mexican and international companies. Now the firms established in the sector use modern technologies and are able to produce high quality products at competitive prices in Mexico and overseas (INAES, 2000).

Figure 5 shows, from 2010 to February 2013, the sales volume in thousands of kilogram/liter, the average price for product in Mexican pesos (the national currency in Mexico), the percentage of numerical distribution (indicates the fraction of sales point that is covered by the product) and average sales per store per month in kilograms/liters. Comparing the first bimester in 2010 to the correspondent time in 2013, the average price moved from $49.5 MXN to $59.5 MXN, a 20% growth. By November-December 2010 the price exceeded the

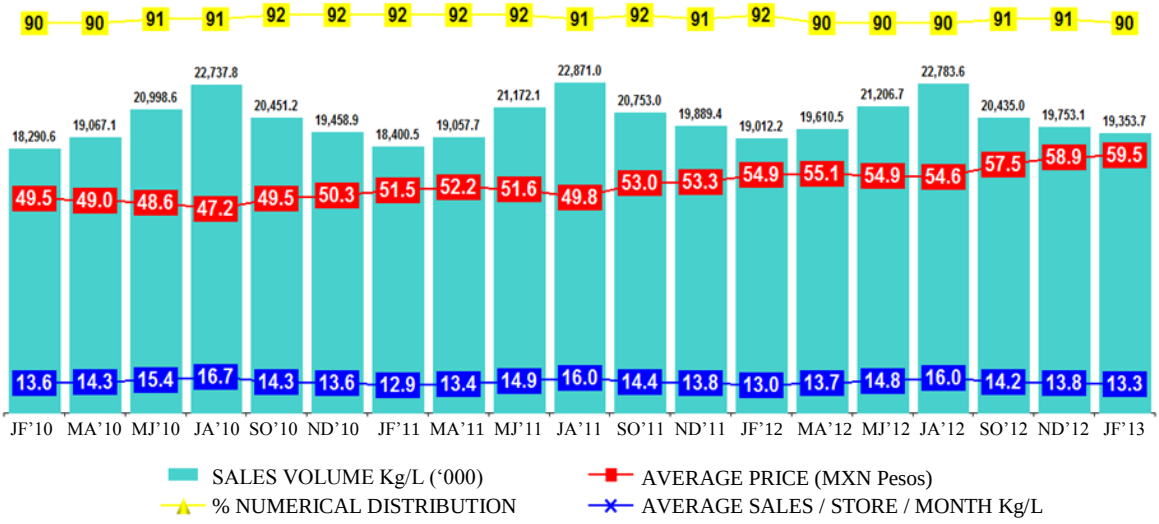

Figure 5 - The toilet soaps market evolution, Source: Nielsen

$50 MXN barrier and never returned down, with the exception of the bimester July-August 2011 that recorded an average price of $49.8 MXN. Considering the percentage of numerical distribution variable, toilet soaps are present in about 91% of the point of sales. The tendency of the sales indicates that a seasonality exists, occurring peaks of transactions in the July-August period. This can be mainly justified by the seasons of the year and the existence of a commercial campaign called "*Julio Regalado*" initiated by a Mexican retailer that offers large discounts to their customers in the month of July (Business Analytics, 2014).

Figure 6 presents how the toilet soaps are sold concerning their form. Regarding this feature, the hand bar soap is the main segment, representing 90.6% in 2013 (a 2.2% fall from the previous year). In the same time extent the liquid body soap went from 1.8% in 2012 to 2.1%, and the liquid hand variety grew 37.7%, reaching a total of 7.3%.

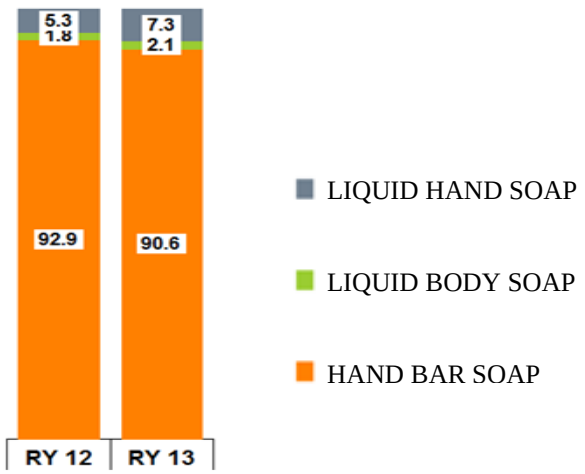

Figure 6 - The toilet soaps market evolution considering format, Source: Nielsen

2.3 Household market

The Household product family constitutes the other core business for the client. Bearing in mind the information given in "Health & Beauty market" sub-chapter, a similar analysis is here presented for the household market, this time considering the period from the bimester February-March to December-January for 2014 and 2015 (Figure 7).

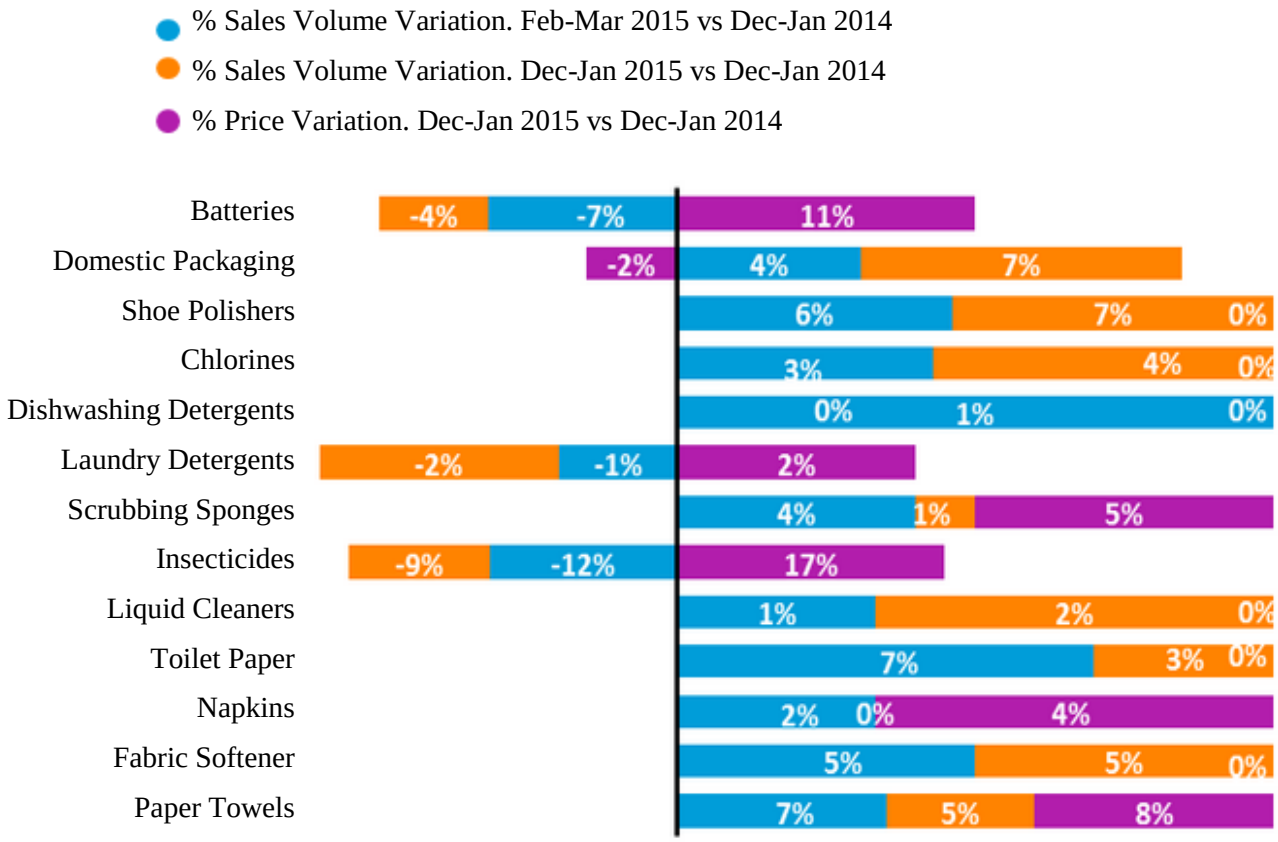

Figure 7 - Sales volume and price variation in the household market, Source: Nielsen

Observing the different types of products of this family, "Batteries", "Laundry Detergents" and "Insecticides" were the only ones who had a decrease on their sales in the considered time. Also, the last mentioned registered the biggest positive variation of price in the category with 17%. The products for domestic packaging had a downfall of their prices (2% reduction when compared to the same period in the previous year), while the remaining types of product maintained or increased their prices. In the context of this project, the behavior of the "Laundry Detergents" assumes more relevance. For the same time frame, a 2% positive variation on the price led to an equivalent fall in the sales volume. When considering the period December-January 2014 to February-March 2015 the sales volume varied negatively 1%.

Laundry Detergents market

This specific market contains detergents with several presentations (powder, liquid, capsules, etc.) where national and multinational companies are competing directly. Laundry detergents are present in almost every store in the country. The volume of the market remained stable through the years, only with relatively small positive variations, while the total market in terms of value increased more significantly, mainly because of the price raises. The protagonists of the market have been concentrating their efforts on formulation improvements to generate value-added attributes, leading to higher average prices. For example, "Ariel" (P&G Mexico), the most recognizable brand in the Mexican market, offered an improved stain removal with no scrubbing required. Despite of the higher price of the product, the brand advocates savings to the consumer due to the detergent does not damage the clothes like other more economical brands in which scrubbing is necessary (Feebbo México, 2015). Other important agents in the market as "Más" (Henkel Mexicana) and "Suavitel" (Colgate-Palmolive de México) opted for these value-added attributes through the time, to differentiate them from the "regular" brands and justify their higher prices to the consumer (Euromonitor International, 2015).

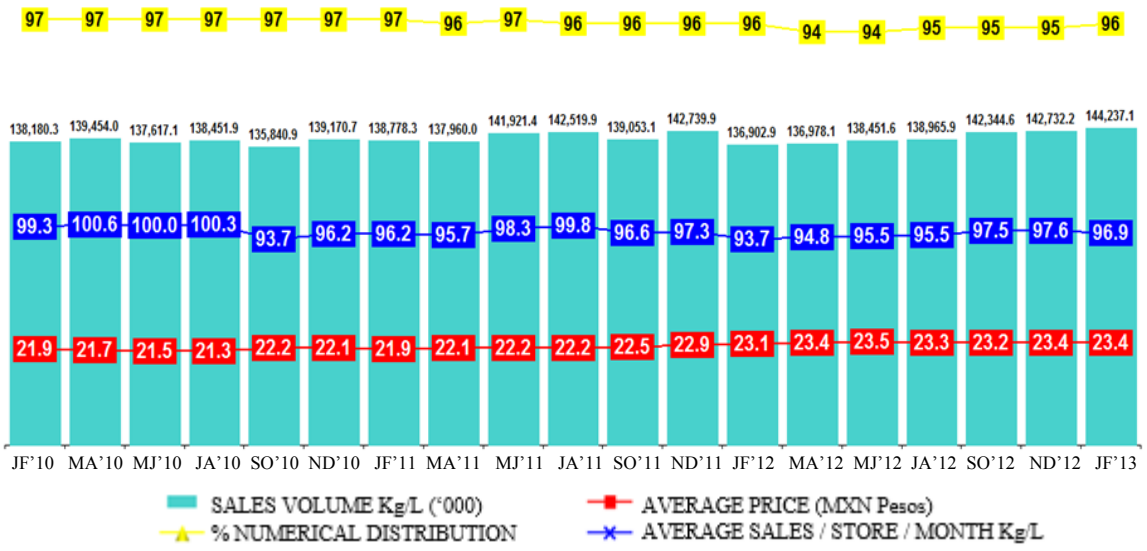

Figure 8 - The laundry detergents market evolution, Source: Nielsen

Repeating the analysis made and presented for the "Toilet Soaps market", it is possible to understand the major trends in the market of laundry detergents. Taking into account the period from January-February 2010 to January-February 2013 the market remained relatively stable considering price and sales volume. In 2012, the volume of sales grew consistently throughout the year, starting with 136,903 thousands Kg/L to end the period with a total of

142,732.2 thousands Kg/L (a 4% variation). When comparing the same feature, but bearing in mind the registered values for the first bimester of 2010 and equal period in 2013, the sales volume had a similar variation (4.2%). Contrasting the same periods, but now attending the average price, there was a 6.8% increment. That, associated with the augment of the sales volume, led to a raise in the value of the total market. The average price in 2011 and 2012 had an increment of 4.4% and 1.2% when the inflation in Mexico in prices to the consumer was 3.82% and 3.52% respectively. In the second case, as the raise in the average price didn't follow the inflation registered in the country, it can be assumed that in this period this market lost value relatively to the general consumers market (Banco de México, 2015). Observing the numerical distribution, the laundry detergents in 2010 were present in 97% of the total points of sale. In the last considered period in the graph, this type of product was present in 96%, coming from a growing tendency since the March-April bimester of 2012 when the numerical distribution registered its lower point (94% of the total points of sale).

Concerning the presentation form of the detergents, the Figure 9 illustrates the share of the market for the two formats (powder and liquid), comparing the 2012 versus 2013.

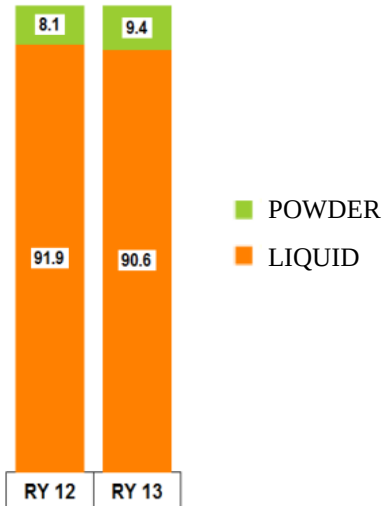

Figure 9 - The laundry detergents market evolution considering format, Source: Nielsen

Regarding the powder detergents, in 2012 they represented 91.9% of the units sold, but in the following year that share decreased to 90.6%. This contraction, allowed the liquid variety to pass from 8.1% to 9.4% in the same period (a 17% growth). Despite of the efforts from the companies to enter with other formats, the tradition or the consumption habits of the customers keeps the powder detergent as the most relevant format in the market (Feebbo México, 2015).

3. Revenue Management

Revenue Management can be resumed as a variable pricing strategy that pretends to sell the proper product to the right client for the right price at the right moment. Based on historical data and market tendencies, it intends to understand and predict demand for a given price, which permits the design of a price strategy to aim the most benefit possible (Cross, 1997). For instance, the application of a revenue management strategy allows to:

- Define meticulously potential discounts to build market share;
- Increase revenue without expanding products range or rising promotions;
- Discover hidden demand which consents opportunistic pricing and identify uncovered revenue possibilities;
- Understand consumer trade-offs between price and other product attributes;
- Use market intelligence as a competitive weapon;
- Establish a revenue-driven organization focused on profitable growth.

3.1 How it started

This strategy is progressively gaining attention as one of the most successful application areas of operations research. It started in the second half of the 1970's decade with the deregulation of the United States airline industry, when "People's Express", a newcomer in the industry, offered to the customers a service with minimal amenities for low-priced tickets. "American Airlines" and "United Airlines", the major companies in the business, answered back by offering a few seats at even lower fares but maintaining the "old" higher fares for the remaining places, meaning that similar seats on the same aircraft were now being sold for different prices at the same time. With this approach, the two major carriers attracted the passengers more price-sensitive, while still maintaining their other higher-paying customers, resulting that many "People's Express" passengers switched to the main companies, leading to its bankruptcy (Ingold, McMahon-Beattie, & Yeoman, 2000).

3.2 Nowadays – The Decision Problem

Nowadays, revenue management is applied in several industries as airlines, hotel chains, telecommunications, rental car, insurance companies and by major consulting and software firms. It guides the decision of how to allocate identical products to the available demand to generate the most profit or revenue. Then, the problem becomes of how the given capacity should be assigned to products in a way that maximizes the total revenue. In the airlines

example, the demand can't be precisely measured. The volume of customers with high willingness to pay usually only book closer to the departure time, while other passengers who cannot afford the highest prices will make their reservations earlier. Considering the capacity, an empty seat represents a hypothetical cost, because it could have been sold to a potential paying customer, generating a positive contribution margin when compared with the very low marginal costs of carrying an additional passenger. Defining the amount of seats per segment of prices it is a decision that has to be made, comparing the scenarios of having more passengers with a low yield or running the risk of not having enough higher yield demand to fulfill the flight capacity.

The process of these decisions of selling (where and when to sell and to whom and at what price) addresses three basic categories of demand-management decisions: structural, price and quantity (Talluri & Van Ryzin, 2004).

- **Structural decisions**: concerning the selling format (negotiations, auctions…), the segmentation or differentiation mechanisms, the terms of trade to offer (volume discounts, refunds…), etc. These are normally strategic decisions, not taken very frequently on the daily activity of a company.

- **Price decisions**: how to price across product categories and over time, the discounts plan over the product lifetime, etc. These can be affected by, for example, the variation of the production cost.

- **Quantity decisions**: whether to accept or reject an offer to buy, how to allocate output or capacity to different segments, products or channels. For instance, the quantities can be adjusted according to the flexibility of the supply process and the costs of reallocating capacity and inventory (Talluri & Van Ryzin, 2004).

3.3 Demand Variability – The Concept of Elasticity

Elasticity measures how buyers and sellers react to changes in market conditions. Typically, consumers buy more of a good when its price is lower, when their financial power is higher, when the prices of substitute goods are higher, or when the prices of complementary goods are lower. These variables, when changed, produce variations in the demand. To quantify the magnitude of these changes, the concept of price elasticity of demand is used (Mankiw, 2009).

The law of demand states that a fall in the price of a good raises the quantity demanded and the price elasticity of demand for any good measures how willing consumers are to buy less

of the good as its price raises. As a measure of behavior, it can be applied to individual households or to market demand as whole. The demand for a good is called elastic if the quantity demanded responds significantly to price changes. On the other hand, is considered inelastic if the quantity demanded doesn't vary or vary only slightly to changes in the price (Mankiw, 2009).

The knowledge of the consumers' demands is key information on which producers and sellers in general base their profit-maximizing pricing and marketing techniques. There are two major interpretations for demand variation:

The first applies to markets composed of a large number of consumers and each one is assumed to buy at most one unit of the product and will not buy additional quantities if the price drops. This market is constituted by heterogeneous consumers, in the sense that each consumer may have a distinct level of willingness to pay for a unit of consumption (caused, for example, by differences in income or utility generated by the product). In this case, the market demand quantifies the amount of consumers whose willingness to pay equals or exceeds the market price of the product.

The second interpretation adds the possibility of customers increasing their consumption of the product if there is a price decrease in the market. This "version" is more suitable for markets of flow goods, where small price reductions can lead to more frequent purchases. For this matter, this characteristic confers a higher short-term sensitivity to the market (Case, Fair, & Oster, 2012).

3.4 Where to apply Revenue Management

A good revenue management system helps to coordinate complex information which can then be used to make better pricing and duration control decisions. Most of the times, the success of a revenue management strategy is backboned in an effective control of customer demand. An important factor of manipulation of the demand is the price. Many companies offer price-related promotions to augment or shift peak-period demand (early bird specials, special promotions), including "time of the day" pricing, "day of the week" pricing and price premiums or discounts for different segments of clients. Considering the production management, customer-arrival patterns and the ways of influencing customer duration must be understood, so they can streamline and control effectively their service-delivery process. Successful revenue management applications are generally in industries where both capacity and customer duration can be managed (variable price and predictable duration), like hotels,

airlines, rental cars and cruise lines. Some other industries don't fulfill both parameters: for example, cinemas and convention centers have a predictable duration but a fixed price. On the other hand, restaurants have a fixed price but its services have an unpredictable duration in most of the cases (Shy, 2008).

Bearing in mind the many industries that exist, the application of revenue management technics are more effective in businesses with certain characteristics: customer heterogeneity; demand uncertainty; management culture; price as a signal of quality; production inflexibility; and data and information systems infrastructure (Talluri & Van Ryzin, 2004).

- **Customer Heterogeneity**: Having heterogeneity in the market permits to exploit variations related to willingness to pay, to preference for different products with certain characteristics and variations of the purchase behavior over time. If a product is perceived and value in an identical way by all the customers, the range of available strategic approaches is significantly reduced. Hence, the more diversity in customers, the more potential there is to exploit this heterogeneity strategically and tactically to improve revenues.

- **Demand Uncertainty**: The quantity of demand can be affected by many factors: increased competition, new products, etc., or even due to simple seasonality. The more demand varies over time the more difficult the decisions linked with demand-management will be, raising the potential to make poor decisions. Therefore, to reduce this risk is important to have efficient tools to analyze and evaluate all the resulted data.

- **Management Culture**: Following the previous pointed characteristic, there has to be a management culture to be receptive to innovation instead of approaches more based on "feelings" and intuitions, and have the capacity of acceptance of the inherent risks associated to the introduction of new practices. The education and professional background of the industry managers and leaders could be a key aspect in whether a company is willing to take some risks or choose the more conventional approach.

- **Price as a Signal of Quality**: The price can be intended as a sign of quality mainly in the luxury goods. In this kind of products, the price works as a status symbol by its lack of accessibility to the average consumer, and the thoughtless manipulation of this feature could damage that status. This idea is more relevant in products where its quality it is not easily accessed through any other mean (e.g. the price of a bottle of wine on a dinner menu: it is generally assumed that the most expensive bottle is the one which has better quality). Taking this into account, the application of revenue management it is not suited to products where prices works as a status symbol and as a signal of quality.

- **Production Inflexibility**: An inflexible production leads to more complexity in managing the demand, in order to establish a priority between projects to deal with the emerged variations. The more the inflexibility of the production, the more fixed costs and economies of scale involved in productions, the more switch-over costs and capacity constraints, and therefore more difficulties to match demand variations. A company that can reply to all the variations in the demand easily and without significant cost, the complexity of demand management diminishes drastically.

- **Data and Information Systems Infrastructure**: revenue management is more suited to industries where transaction-processing systems are efficiently employed as part of the daily business process. This data results on information of how the demand works turns possible its characterization and the construction of its mathematical models. It requires systems to collect and store data and to implement and monitor real-time decisions. Applying RM in industries without these databases in place can consume great amount of resources and produce risky outcomes for lacking of historical basis (Talluri & Van Ryzin, 2004).

3.5 The generic Operations of a Revenue Management System

Revenue Management generically follows four steps: data collection, estimation and forecasting, optimization and control. Figure 10 shows the process flow in a typical revenue management system. Data is fed to the forecaster; the forecasts become input to the control optimizer; and finally the controls are uploaded to the transaction-processing system, which controls actual sales (Talluri & Van Ryzin, 2004).

Data collection is important to maintain a record of the relevant historical data, such as prices, quantity demanded, relevant circumstantial factors, etc. A formal data collection process is necessary as it ensures that the gathered data is defined and accurate and impute some validation to the decisions based on the findings. Estimation and forecasting has the purpose to find a business's potential demand so managers can make accurate decisions about pricing, business growth and market potential, grounded in the information collected in the previous step. It allows to estimate the parameters of the demand model and to forecast the demand or other relevant quantities for the business, according to the parameters defined. The third step, optimization, has the goal to optimize the set of factors that make part of the selling process (prices, discounts, markdowns, allocations…) to apply until the need of a re-optimization is verified. Control represents the procedure of supervising and managing the sales evolution in the period using the optimized controls stipulated in the optimization step.

Typically these steps can be repeated through the process, depending of the project. Projects with large volumes of data, fast changing business conditions and with specific forecasting and optimization methods request that those procedures should be reviewed more frequently and methodically.

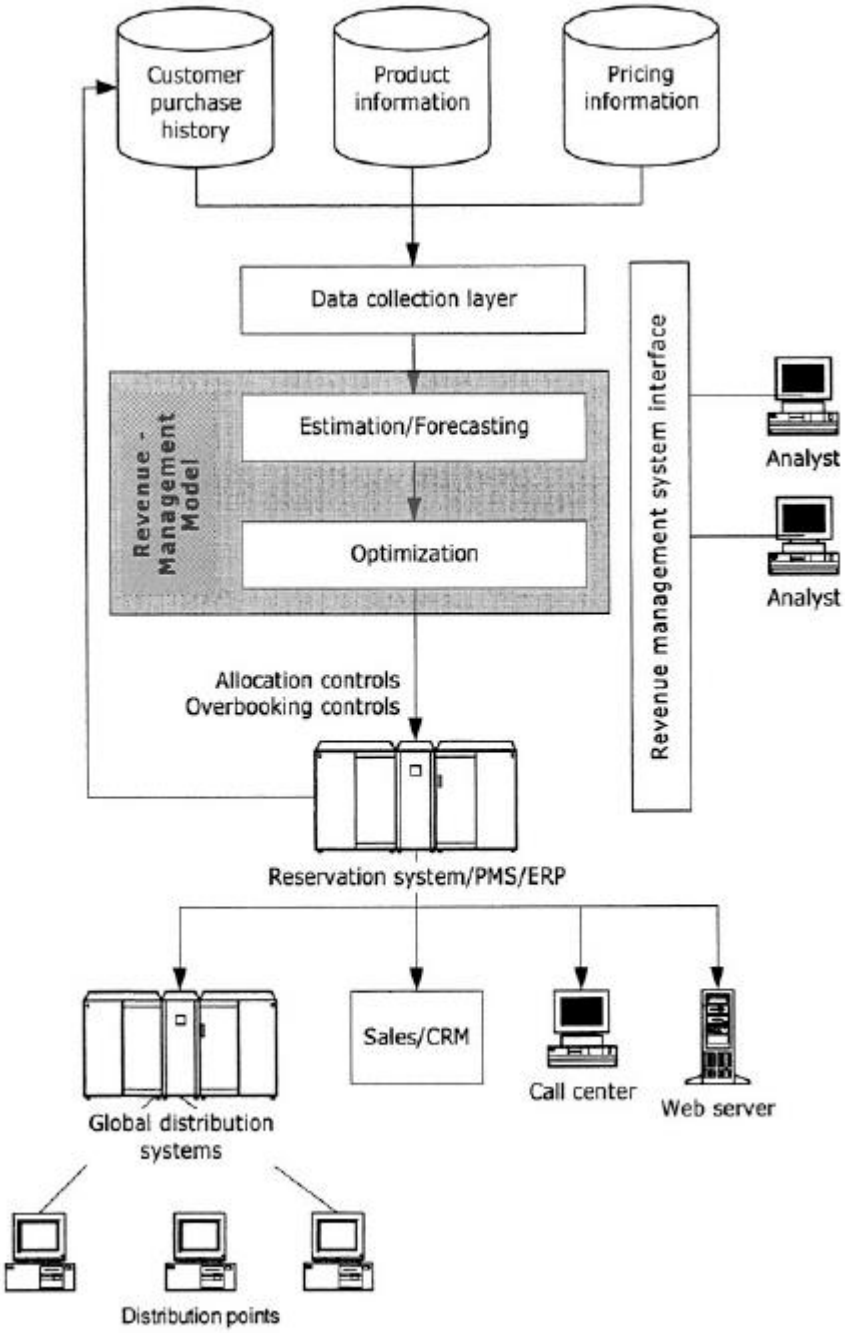

Figure 10 - Process flow in a revenue management system, Source: "Talluri, K. T., & Van Ryzin, G. J. (2004). *The Theory and Practice of Revenue Management.* Boston: Kluwer Academic Publishers"

3.6 Revenue Management Implementation

Given the needed coordination between different departments of the company and rapid communication that is required, any revenue management implementation should involve careful review and planning for the new organizational design, both at the project stage and at the operational stage. It is important to have all teams involved in every step of the way: from the initial proposal, to implementation, to training, to performance measurement. To support the firm's revenue management objectives it is essential to adapt the products, align incentives and organizational structures, change business processes and train the employees to operate the required duties (Sfodera, 2006).

Kalyan T. Talluri and Garrett J. van Ryzin in their book "The Theory and Practice of Revenue Management" define a task list for a typical implementation of a project of this matter (Figure 11), considering all the stages (pre-implementation, implementation, operations and benefits measurement).

Taking into account the implementation stage, the segmentation and product design are the first procedures to contemplate. The purpose of segmentation is to understand what type of consumer is buying the product, how it is bought, what kind of features they are looking for in it and their willingness to pay. Having this information, the consumers should be divided and classified according to these characteristics, to help to perceive how the different segments detected should be approached in order to increase revenue. The product design aims to match the product features to target each potential purchasers segment. A revenue management project consumes a relevant amount of resources, in terms of time consuming, organizational changes and the implementation and development of the system can be expensive. Hence, it is compulsory to analyze the investment and measure if the benefits justify the costs. Commonly are used two types of analysis to validate the system benefits: "revenue-opportunity assessment" and "revenue-benefits measurement" (Talluri & Van Ryzin, 2004).

- **Revenue-opportunity assessment** is performed before the actual implementation of the revenue management system and there are two basic approaches. The first one is based on the analysis of the historical data and fitting the demand functions to the responses observed to the stated prices. Then it is possible to analyze the quantity or price controls that would have maximize the revenue or market share with perfect knowledge of the demand. The second approach is simulation. This one aims to model consumer behavior, model the uncertainties associated to sales practices and build a variety of possible scenarios to prepare an eventual reality. Despite of these advantages, this approach is time consuming and there

are made a series of modeling assumptions that may not quite correspond to the real conditions.

- **Revenue-benefits measurement** is a study to compare the differences between the revenue management implementation consequences and the results that would have been obtained with the previous strategy. Therefore it is important to collect all the relevant data (e.g. own and competitors prices and products) for a significant period (both prior to and after implementation of the revenue management system) to establish a term of comparison. However, if there are major changes in the marketplace or economic conditions, the results of benefits measurement can lose credibility (Talluri & Van Ryzin, 2004).

The normally huge amounts of collected data require a system architecture, hardware and software able to handle and store those databases and perform multiple forecasts on a daily basis. Regarding all of these features to implement and manage this type of project, it is compulsory to have an efficient organizational and training plan in the company. A bad planning can lead to an under-performed revenue management system, to the waste of the resources applied and to misleading premises.

	Task List
Pre-implementation	Form interdepartmental team (task force)
	Rough revenue opportunity model (industry and firm specific)
	Form business case
	Formulate strategic role
	Senior management buy-in
	RM audit
	Start polling vendors
	Start collecting data
	Buy or build decision
	Revenue opportunity analysis (simulations)
	Engineering study
	Formulate requirements
Implementation	Market segmentation/product design
	Database design
	System architecture design
	Model and system testing
	Data cleaning and validity testing
	Legacy system integration/phase-out
	Coordination with sales and product design
	Pricing feeds
	Hardware
	Software installation
	Analyst training and education
	Organizational changes
	Sales and customer-service agent training
	Testing phase
Operations	Cutover and ramp-up
	Monitoring and tracking
	Alerts and overrides monitoring
	Forecast error measurement
	Optimization performance measurement
	Overbooking and denied boardings
	Customer service complaints
	Groups performance
Benefits measurement	Before/after comparison
	Simulations

Figure 11 - Task list for implementation of a revenue management project, Source: "Talluri, K. T., & Van Ryzin, G. J. (2004). *The Theory and Practice of Revenue Management.* Boston: Kluwer Academic Publishers"

4. Methodology & Solution

Recovering the problem presented to Aurigam:

"What should be the price for each SKU to the final consumer, considering the different distribution channels, in order to maximize profit and/or market share?"

This chapter describes the methodology developed to design the primary mathematical models that measure the demand variability caused by the price variations of the SKU. These models will serve as base of construction of pricing techniques grounded on the historical information available and regulation of the selling prices according to the distinct distribution channels and market chains.

4.1 Previous Context of the Project

The project started with an analysis of the actual management of the diverse distribution channels. The intention was to give a general comprehension of the role of each canal and SKU in the price construction, as well to understand the influence of players in the negotiations. A distribution channel is "*the path through which goods and services travel from the vendor to the consumer or payments for those products travel from the consumer to the vendor. A distribution channel can be as short as a direct transaction from the vendor to the consumer, or may include several interconnected intermediaries along the way such as wholesalers, distributers, agents and retailers*" (Business Dictionary, 2015). Based on the defined commercial plans and on interviews to the key decision makers, it is analyzed the contribution per channel, how the price margin is built and the price differential to the public in the points of sale. The main goal of this first step is to trace the route that SKU follows to reach the consumer through the several distribution channels, to understand the players' contribution and to determine what is the actual final price offered to the customer. Knowing this information permits to establish the ranges for price variation.

Here the price margin is intended as the difference between the selling price to the wholesaler/ retailer and the price to the final consumer. Hence:

$$PM = PC - SP$$

Where,

PM, is the price margin

PC, is the price to the final consumer, and

SP, is the selling price to the wholesaler/ retailer.

In this study two distinct distribution channels are considered:

Wholesale: the sale of goods in large quantities (bulks), usually for resale in smaller amounts at a profit. Preferably business to business rather than to individual customers;

Retail: the sale of goods in small quantities directly to the final consumer.

In Mexico, the retail market represents about 66% of the consumer goods total market (INEGI, 2015).

In order to perceive the magnitude of the margins practiced in these channels, Aurigam spotted the price margins applied in the main retail chains and wholesalers for the major areas in Mexico. The information collected was obtained through own and client's databases, price lists from different producers and field recordings. These findings will permit understanding where the client company's margins fit and how can they be "played".

Other fundamental sources of data used in this project were: the databases from NIELSEN; ISCAM; and the internal data from the client company.

NIELSEN "*studies consumers in more than 100 countries to give the most complete view of trends and habits worldwide*" (Nielsen, 2015). In this case, their databases are divided in two categories for the consumer goods market: "Price Track" and "Scan Track". The first one contains information about prices registered each week for every SKU from every brand present in the main retail market chains. Also, it is possible to discriminate the data for fabricants, market chains and presentation formats concerning volume (heavyweight), type (liquid, powder, etc.) and number of pieces. The second category includes all the product features as in "Price Track", but instead of distinguishing for retail chains, presents its information regarding the main cities in Mexico. Apart from those attributes, "Scan Track" contains the total sales volume for each SKU in terms of value, pieces and tons in the retail market. The databases from NIELSEN functioned as an essential "groundwork" of all the performed calculations.

ISCAM ("Información Sistematizada de Canales y Mercados") provides information and indicators from the Mexican wholesale market. This database allows filtering the data throughout time (in monthly figures) per SKU, brand, product category (detergent and soap) and sub-category (bar, powder, liquid, capsules, etc.), per fabricant and per geographic area. Beside these aspects, the database provides information about sales volume (value, pieces and tons) and prices per unit or kilogram/liter calculated by weighted average.

With the purpose of confirming the client's prices and volume of sales (for wholesale and retail) these databases are compared with the available internal information and sell-out data bought by the client company from several market chains.

4.2 Methodology

The structure of the methodology used for the construction of these models was based in part of the idealization made by Kalyan T. Talluri and Garrett J. van Ryzin in their book "The Theory and Practice of Revenue Management" of a process flow in a revenue management system. This vision, as presented in the sub-chapter 3.5" in the page 18 of this dissertation, begins with the data collection and its audit. Having this information filtered, it is possible to start producing the preliminary mathematical models that will reflect the market behavior for each SKU in the distinct market formats. Once the mathematical approach is concluded, the equations are evaluated by their statistical viability and the fittest model is selected. The following sub-sections describe with more detail the stages of the methodology applied.

4.2.1 Data Filtering

Recovering the process flow of a revenue management system, the Figure 10 defines three key-types of data necessary to proceed to the revenue models: "Customer Purchase History", "Product Information" and "Pricing Information". The databases previously mentioned, allow obtaining these types of information. NIELSEN has the info for the main market chains in the retail market, while ISCAM reunites the total sales (in value and units) per week for each SKU in the distinct formats of wholesale market.

However, in order to improve the quality of the data the following procedures were taken:

- Removal of information about cities that are not covered by a specific retail chain (Figure 12);
- By means of an outliers analysis, SKU with wrong reported prices were discarded (Figure 13);
- SKU with high frequency of price variation per week were not considered (Figure 14). It is not a common practice to produce those price changes in such short span of time. These registers can be a cause of bad reported prices, thus the application of this last criterion.

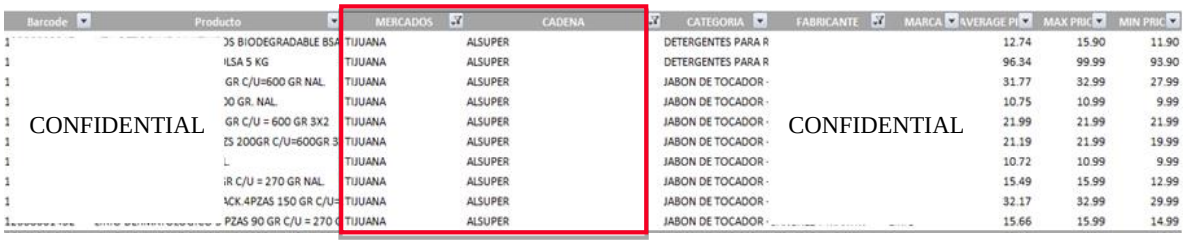

Figure 12 - Example of data audit

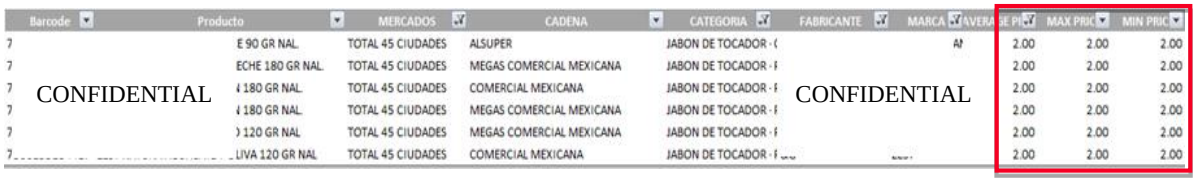

Figure 13 - Example of wrong reported prices

Figure 14 - Example of SKU with high frequency of price variation

Concerning the ISCAM databases, the usage of the weighted average price doesn't allow understanding the proper selling price to the customer per intervenient and frequently occurs that these prices don't match with the information gathered in the field (Figure 15).

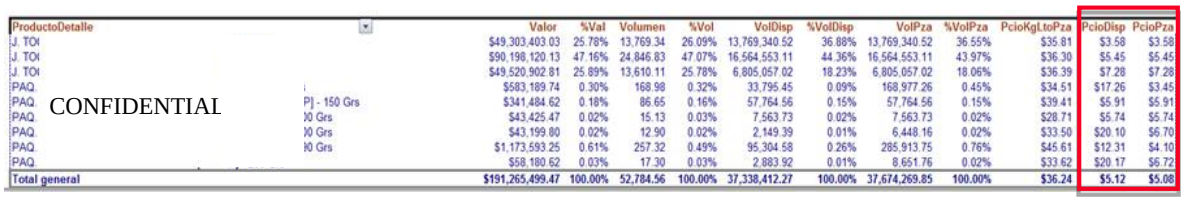

Figure 15 - Example of ISCAM data

For the construction of the models, in order to mimic as real as possible the respond of the demand to price changes a few parameters were considered. Using the sources of data available, for every SKU the price and sales history was contemplated, keeping in mind the different market chains and their distinct formats (Figure 16).

numweek	group	format	q_ 4 PZAS.1	ppp_ 4 PZAS
201342	Soriana	Hiper	1101	27.13
201343	Soriana	Hiper	1328	26.78
201344	Soriana	Hiper	1687	26.11
201345	Soriana	Hiper	1418	26.43
201346	Soriana	Hiper	1550	25.05
201347	Soriana	Hiper	1592	26.55
201348	Soriana	Hiper	1624	26.11
201349	Soriana	Hiper	1477	26.27

Figure 16 - Example of the selected information

Figure 16 gives an example of the available information. "Numweek" identifies the specific week which the information refers to, "group" indicates the market chain that distributes the product and "format" corresponds to the type of venue where the product is sold. For instance, for the retail market were considered the following market chains and formats (Table 2).

Table 2 - Retail chains and formats considered

Group	Walmex	Chedrauí	Soriana	Casa Ley
Format	Supercenter	Super Che	Super	Super Ley
	Superama	Chedrauí	Mercado	Fiesta Europea
	Bodega Aurrera	-	Express	Compacto / Express
	-	-	Hiper	Fiesta Compacta

4.2.2 Mathematical Approach

To measure the effect of own price variations and the seasonality influence, a multivariable linear regression approach is used to model the relationship between the dependent variable (demand) and the independent variables (e.g. price, time…). Regression analysis is a commonly used method for obtaining a prediction function for calculating the values of a response variable using predictor variables. A study of the relationships among factors in a given system can help in predicting, determining and controlling the "driving forces" that affect the system (Graybill & Iyer). The option for a linear regression comes from the shape of a standard demand curve and from the goal of this project. Bearing in mind the concept of elasticity presented in the sub-chapter "Demand Variability – The Concept of Elasticity" at page 15, a demand curve is generally divided into three distinct sectors. Figure 17 shows the standard shape of a demand-price curve of a consumer good, relating the quantity of a good demanded by the market at a given price (Case, Fair, & Oster, 2012).

The region in Figure 17 designated by the letter "A" represents the section where there is a very high demand for the product at very low prices. In this situation, the price is well below the regular price of the market, thus the product achieves to capture the market segment more sensitive to this feature. The section symbolized by the letter "C" represents the demand that has low elasticity to price. In this case, this characteristic is not a relevant factor in the purchasing decision for the demand of the product. The middle section "B" represents where the majority of the consumer goods are. In this region, there is more balance in the price-demand relationship and generally is where the sellers/ producers obtain bigger revenues.

Hence, the pricing strategies in this sector have to be effective in order to accomplish the most profit possible. The aim of this project is to discover which prices within this range allow the company to reach its goals. The curve in this sector assumes a linear shape, motivating the choice for linear models to attempt to represent accurately the market behavior for small variations of the price.

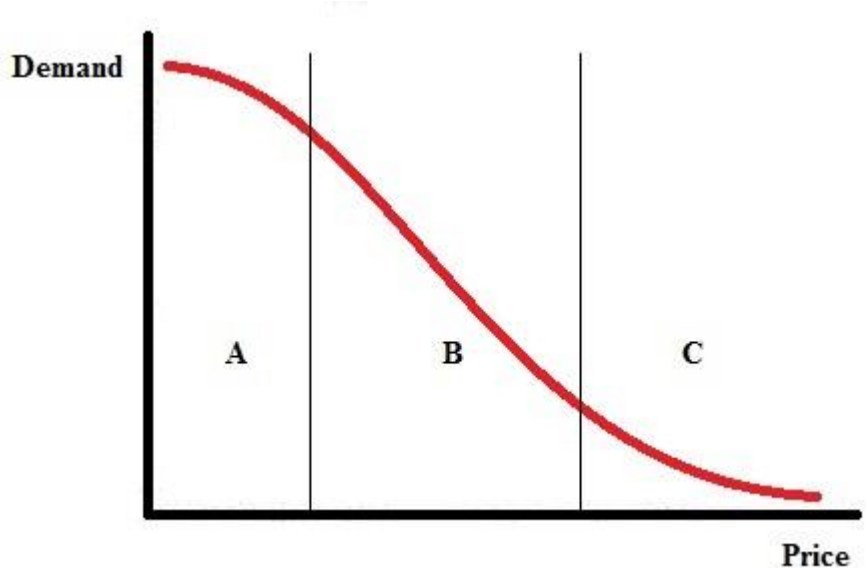

Figure 17 - Standard demand curve of a consumer good

To corroborate the option for a linear regression, a correlation analysis between the variables price and demand was executed. In order to understand visually the relationship between these two attributes, Figure 18 shows price-demand "scatter plots" for key SKU from the client company in distinct market formats. The data used to plot the graphs (Annex D: Scatter Plots Data Series) are from the original data series of the sell-out information proportionated by the client, with no filters applied.

Figure 18 displays "scatter plots" for three distinct SKU in three distinct market formats. The relation price-demand for "*sku b*" is analyzed for "Fiesta Compacta" and "Bodega" and in both situations asumes a linear relationship. Observing the four graphs this association is verified in all four situations.

Validation of the models

In the interest of models validation, two statistics will be considered: the adjusted coefficient of determination and the p-values.

The coefficient of determination (R^2) measures how the predictor variables determine the response variable. This index may be interpreted as the proportion of the total variability in the independent variable that is accounted for by the response variables. The ratio is calculated using the sum of squared deviations and the sum of squared residuals. The sum of

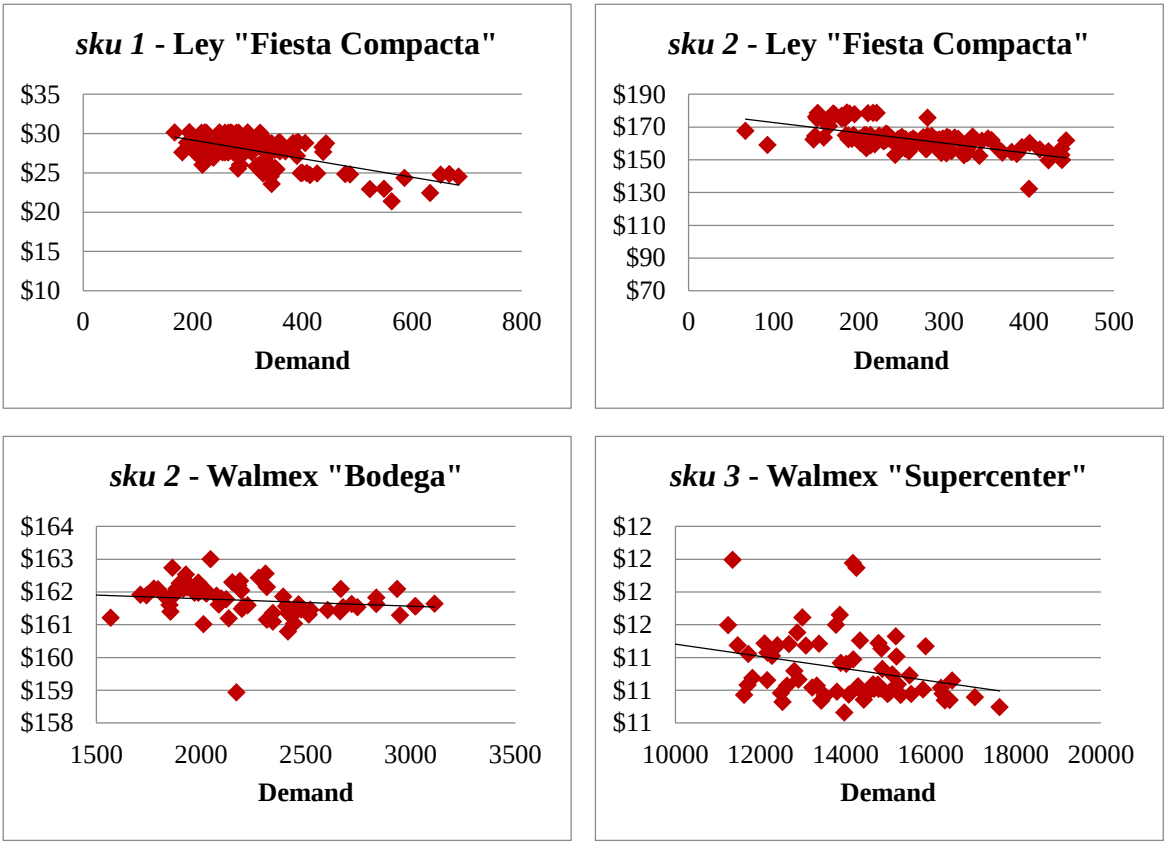

Figure 18 - Price-Demand scatter plots

squared deviations (SST) stands for the total sum of squared deviations in the values of the response variable from its mean. The sum of squared residuals or errors (SSE) represents the sum of the squared difference between the estimated and the real value of the response variable (Chatterjee & Hadi, 2006).

To calculate R^2:

$$R^2 = 1 - \frac{SSE}{SST}$$

Where,

R^2, is the coefficient of determination,

SSE, is the sum of squared residuals, and

SST, is the sum of squared deviations.

This coefficient can take values from 0 to 1: if R^2 is equal to 1 indicates that the fitted model explains all the variability of the response variable; if R^2 is equal to 0 means that there is no linear relationship between the response variable and the predictors. The value of the coefficient generally increases with the number of explanatory variables, even if they don't contribute positively to the accuracy of the model. Therefore, the adjusted coefficient of

determination is used because only increases if the independent variable improves the value of R^2 more than it would be expected by chance. It is defined as:

$$\bar{R}^2 = 1 - (1 - R^2)\frac{n-1}{n-p-1}$$

Where,

$\bar{R}^2$, is the adjusted coefficient of determination,

R^2, is the coefficient of determination,

n, is the sample size, and

p, is the number of predictors in the model.

Due to the difficulty to predict the demand considering the many parameters that interfere in it, it was established a minimum value of 0.5 for the adjusted R^2 to validate the mathematical model. The value of 0.5 means that 50% of the variance in the dependent variable can be justified by the predictors, while the other 50% can be attributed to unknown or intrinsic variability.

Concerning the p-values, they are used to judge the significance of the calculated coefficients. In general terms they identify how likely the results founded are due to chance: a small p-value suggests the rejection of the null hypothesis, which states that there is no relationship between variables (Business Dictionary, 2015).

For the purposes of this project, the intention is to validate the cases where the null hypothesis is rejected. Hence, the models are considered valid if the p-values of the calculated coefficients are inferior to the level of significance of 10% (p-value < 0.1).

Related Approaches – Other methods to Estimate Demand Curves

In order to estimate the curves of the demand, there are other methods that can be used. One of them is to carry out direct market experiments. The main principle is to vary the price of a determined product while the other market variables are fairly stable (i.e. there are no significant price changes in the competition, unusual commercial promotions, etc.) and measure the variations produced in the demand, comparing them with a similar period or other point of sale with the unchanged price. The direct experimentation can be very expensive and risky, whereas customers may be lost (if the price of the product is raised and potential buyers are driven away) and profits cut by the price variations. In addition, the process can take a relevant amount of time, as it needs to obtain an important number of

observations to produce significant results. In opposition to the direct experimentation, the experiment can be carried out in a controlled laboratory where consumers are given money and told to shop in a simulated store. This approach can be useful, but suffers from the fact (as it is in a simulated environment) that the consumers do not act like they normally would in a "real situation". Other method to estimate demand curves is through consumer interviews. It is a common practice in certain companies to interview consumers and survey them about their consuming habits. However, the direct approach of asking people how much they are willing to pay for a product, the hypothetical answer may not correspond to what would be the real action. Despite of the limitations of the interviews to define optimal prices, it can be very useful to understand other parameters/ features that influence the consumer's decision. Therefore, this method can be an interesting complement to a mathematical approach to produce the equations of demand variability (Winter-Ebmer).

In addition, the time available to develop this project and the quantity of SKU and distribution channels to analyze, support the option for regression analysis as an effective method to generate the preliminary models.

4.2.3 Regression Analysis

Regression analysis is a statistical method that can be found in several scientific fields. It is the method to discover the relationship between one or more dependent variables and the predictors. The purposes of this type of analysis cover three aspects:

1. Predict the dependent variable based on a set of independent values;
2. Establish causal relationship between dependent and independent variables
3. Screen variables to identify which ones are more influent to justify the dependent variable, so that the casual relationship can be determined more accurately (Yan & Gang Su, 2009).

Also, there are three types of regression: the simple linear regression which is used to model the linear relationship between two variables (one dependent and one independent); the multiple linear regression which is very similar to the first type, but with more than one independent variables; and the nonlinear regression which assumes that the relationship between the dependent variables and predictors is not linear in regression parameters.

The initial approach was to understand the reaction of the demand to price changes, taking into account the different points of sale where the SKU are sold. To study the tendencies of consumption over the time and purchase patterns, the variable "numweek" is useful to divide the data in fortnights and months (Figure 19).

"t_pnielsen" is a cumulative variable that helps to distinguish the data per month and will allow tracking the variations of price and demand through time and adjust the mathematical models according to the trends. The differentiation between fortnights is tied to the buying patterns of the consumers. The moment of purchase is usually associated to when the consumers have access to their incomes and have the financial availability to buy the products. Thus, the frequency of wage payments it is relevant for this analysis. In Mexico it is a common practice to define the salaries for payments in every two weeks but the option of doing it monthly it is very recurrent as well. Hence, it is pertinent to perceive how influent this factor is to the demand variability.

week	numweek	t_pnielsen	fortnight
20/10/2013	201342	0	1
27/10/2013	201343	0	0
03/11/2013	201344	0	1
10/11/2013	201345	1	0
17/11/2013	201346	1	1
24/11/2013	201347	1	0
01/12/2013	201348	1	1
08/12/2013	201349	2	0
15/12/2013	201350	2	1
22/12/2013	201351	2	0

Figure 19 - Example of variables used in the mathematical models

Considering the aim of this analysis and the context of the problem, the multiple linear regression was the selected method to study the impact of the price and the market trends over time in the demand for the client's product. The general form of this type of model is:

$$y = \beta_0 + \beta_1 x_1 + \ldots + \beta_p x_p + \varepsilon$$

Where,

y, is the dependent variable

β, are the regression coefficients

x, are the independent variables in the model, and

ε, the error term.

In this case, the dependent variable will be the demand (the quantity sold) affected by the independent variables such as price, time and market tendencies. The variable "fortnight" is a "dummy variable". This type of variable only assumes the value of 0 or 1 to identify if that week corresponds to a period of probable salary payments or not.

Once defined the variables, it is possible to perform this type of analysis for every SKU taking into account all the groups and formats where the products are sold. "Microsoft Excel" was the selected tool to implement this statistical model. By selecting the range of sales history as the range of dependent variables, and the ranges of price history, number of months and the dummy variable "fortnight" as the range of independent variables, Figure 20 exemplifies some of the obtained results.

	Details				Coefficients β				p-value			
Model	Grou	Format	Product	Categor	Intercept	ppp	t_pnielser	fortnight	intercept	ppp	t_pnielse	fortnight
Lineal	Casa Ley	Fiesta Europea	150	Tocador	2758.984219	-69.59854908	23.90494249	37.60905239	0.000258876	0.004624907	0.071267791	0.493565603
Lineal	Casa Ley	Fiesta Europea	150	Tocador	1504.438812	-40.77127646	16.35493831	31.75285164	0.000435406	0.003871836	0.012393517	0.293886554
Lineal	Casa Ley	Fiesta Europea	90	Tocador	3154.53258	-135.578267	50.82589088	170.6445097	0.024284378	0.175461307	0.00149496	0.038027819
Lineal	Casa Ley	Fiesta Europea	90	Tocador	4907.515876	-298.4536078	40.90053027	130.170006	1.16984E-05	0.000141806	0.002178251	0.047843164
Lineal	Casa Ley	Fiesta Europea		Detergentes	2072.928076	-11.00861212	0.043623664	1.8636496	1.57588E-05	0.000149023	0.992958263	0.94673527

Figure 20 - Example of the coefficients and p-values obtained with the linear approach

The "Coefficients β" indicate the value of the respective coefficients that will be then multiplied by the independent variables. On the other hand, the "p-value" set of columns represents the p-values obtained for each variable that, later, will be used to evaluate the quality of the models.

With the coefficients necessary to perform the models for the considered parameters, it is possible to estimate the expected demand for a certain price by multiplication of the coefficients by the respective variables (Figure 21).

Details				Coefficients β							
Grou	Format	Product	Categor	Intercept	ppp	t_pnielser	fortnight	Orig. Price	tpnielsen	fortnight	Q
Casa Ley	Fiesta Europea	150	Tocador	2758.984219	-69.59854908	23.90494249	37.60905239	27.89	10	0	1,057
Casa Ley	Fiesta Europea	150	Tocador	1504.438812	-40.77127646	16.35493831	31.75285164	28.22	10	0	517
Casa Ley	Fiesta Europea	90	Tocador	3154.53258	-135.578267	50.82589088	170.6445097	14.19	10	0	1,739
Casa Ley	Fiesta Europea	90	Tocador	4907.515876	-298.4536078	40.90053027	130.170006	14.19	10	0	1,081
Casa Ley	Fiesta Europea		Detergentes	2072.928076	-11.00861212	0.043623664	1.8636496	178.96	10	0	103

Figure 21 - Example of the results obtained with the linear approach

As an example, interpreting this first linear approach and concerning the first row of results, for a price of 27.89$ MXN it is estimated a volume of sales of 1057 units for that specific product in that format.

To illustrate the mathematical process, "*sku x*" will be taken as an example of the application. The data series of "*sku x*" (Figure 22 and Annex E: "sku x" Data Series) correspond to real data from a SKU of the client company. The information presented refers to the sales in "Soriana-Hiper". Figure 22 plots the relationship between price and demand for the "*sku x*" is this market format. From observation of the graphic, the variables assume a linear association: when the price falls, the demand rises. Having this relationship, applying the linear regression analysis with the variables demand, price, "t_pnielsen" and "fortnight", the price coefficient is expected to be negative (Figure 23).

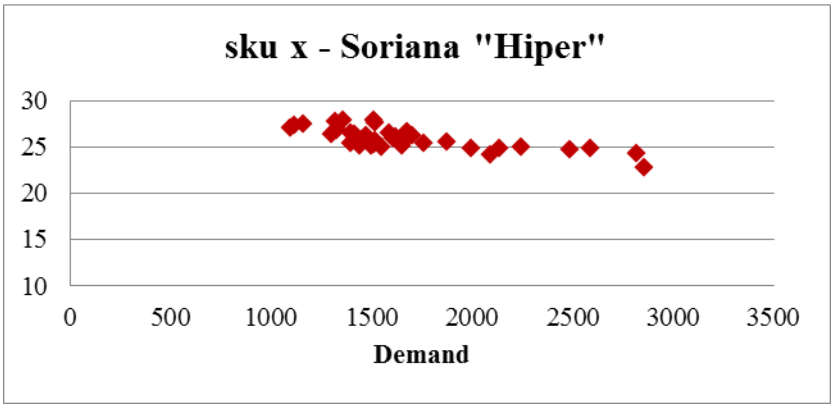

Figure 22 - "sku x" price-demand relationship

Regression Statistics	
Multiple R	0.801165472
R Square	0.641866114
Adjusted R Squared	0.609308488
Std Error	277.9119359
Observations	37

	Coefficients	*Standard Error*	*t Stat*	*p-value*
Intercept	6979.775795	1405.648339	4.96552061	2.0418E-05
sku x	-214.8373795	51.34830257	-4.18392369	0.00019904
t_pnielsen	45.01594143	22.06899817	2.03978183	0.0494433
fortnight	153.024316	94.56582596	1.61817776	0.11514419

Figure 23 - "*sku x*" linear regression analysis output

A negative price coefficient means that if the price rises is expected a decrease in the demand in the proportion of the coefficient. The positive coefficients for the "t_pnielsen" and "fortnight" variables suggest that the demand for the product has been growing through the analyzed period and it is beneficiated by the "fortnight" occurrence (i.e. the demand increases in weeks when salary payments are probable). Regarding the validation criterion defined previously of the adjusted R^2, this regression model is indicated as valid. Concerning the p-values of the attributes and the stipulated maximum of 10%, the use of the variables price and "t_pnielsen" to calculate the model is valid. However, in the case of the "fortnight" attribute, the p-value indicates that 11.5% of the results obtained are due to chance, surpassing the 10% level of significance.

These models intend to replicate how an own price variation in a given time affects its volume of sales, assuming that the rest of the market is unchanged or, if not, the occurred changes do not influence significantly the demand of the client's products. It is important to know how elastic the demand of the several SKU is to price variations.

As mentioned in the previous chapter, price elasticity of demand measures the percentage change in quantity demanded due to a one percent change in price. The general formula of price elasticity is:

$$\varepsilon_p = \frac{\Delta\% \, Q}{\Delta\% \, P}$$

Where,

ε_p, is the price elasticity

Δ%Q, is the percent change in quantity, and

Δ%P, is the percent change in price.

Considering the absolute value, if the elasticity of a product is bigger than 1, a 1% drop in price leads to a raise of over 1% in the quantity demanded. In this case, lowering the price generates bigger revenues. However, for products with elasticity lower than 1, a price drop of 1% produces an increment in the demand below 1%, meaning that bigger revenues are obtained if the price is raised. In the case that the value of elasticity is equal to 1, a price variation leads to a variation in the same proportion in the demand (Case, Fair, & Oster, 2012).

Naturally, the assumption that the competitors do not react to the price changes does not reflect accurately the real market behavior for every product. Thus, another approach is necessary.

The competitors' price is a variable that influences directly the demand for these SKU. In order to incorporate this aspect in the models, it is compulsory to identify first who are those competitors. For that matter, interviews to the commercial and marketing managers were taken and, based on their data and experience in the market, allowed to identify who are their direct competitors in the market. To corroborate this information, a market research was performed to categorize the competitors concerning their positioning and global strategy. To fundament statically the information gathered a correlation analysis was carried considering the price history of the competitors and the market share of each client's product.

In a correlation analysis, is calculated the "Pearson correlation coefficient" that measures the strength and the direction of the linear association between two variables. This coefficient is calculated by the following formula:

$$r = \frac{\sum_{i=1}^{n}(x_i - \overline{x})(y_i - \overline{y})}{\sqrt{\sum_{i=1}^{n}(x_i - \overline{x})^2 \sum_{i=1}^{n}(y_i - \overline{y})^2}}$$

Where,

r, is the Pearson correlation coefficient

x_i, is the value of competitor's price variable

$\overline{x}$, is the mean of the competitor's price variable

y_i, is the value of client's SKU market share variable

$\overline{y}$, is the mean of client's SKU market share variable, and

n, is the number of pairs of observations of x and y.

This coefficient ranges between -1 and +1: if positive, higher values of one variable are associated with higher levels of the other; if negative, higher values of one variable are associated with lower levels of the other. In this case, considering the competitor's price as one variable and the market share of the client's product as the other, a positive correlation is expected: an increment in the competitor's price generally leads to an increase in client's SKU market share; a diminishment in the competitor's price usually reduces the demand for the client's SKU. However it is important to note that the correlation does not prove causation, i.e. a correlation between two variables doesn't necessarily means that one causes the other, but the absence of correlation implies the absence of the existence of a causal association (Graybill & Iyer).

Figure 24 shows an example of the values obtained when applied the Pearson coefficient formula.

	sku 1	sku 2	sku 3	sku 4	sku 5	sku 6
sku 1	1					
sku 2	0.61283205	1				
sku 3	0.26938741	0.43939416	1			
sku 4	0.72247936	0.32927825	-0.09321337	1		
sku 5	0.25554144	0.55711271	0.76322817	0.02483645	1	
sku 6	0.28838912	0.41972798	0.90022524	0.0406832	0.73515415	1
-LIRIO NEUTRO	0.15451563	0.28514465	0.17449562	0.06185825	0.10737438	0.11555384
-NATURALIS	0.1048689	-0.03289441	-0.17525145	0.27820101	0.01043215	-0.03350466
-ROSA VENUS	0.03182916	0.32869862	0.50096555	-0.27020788	0.56548234	0.35040814
-TERSSO NEUTRO	0.54803609	0.60093708	0.75395002	-0.35117811	0.64704727	0.64933484
-ZAZ	0.38919384	0.12061035	-0.42064105	0.40275464	-0.3214631	-0.38254452
-CAMAY	-0.06565849	0.1434685	0.40032694	-0.00971076	0.40172597	0.43201724
-CARICIAS	-0.14437068	-0.00728015	-0.00585378	-0.0160151	0.01651405	-0.09018006
-CORAL	-0.1266719	-0.40152824	-0.33230751	-0.36412945	-0.29185979	-0.35081345
-DOVE EXFOLIANTE	0.17731822	0.28720826	0.52871986	-0.09819838	0.47661496	0.42793138
-DOVE GO FRESH	-0.63648251	-0.89030344	-0.32558158	-0.72728873	-0.01820735	-0.6975237

Figure 24 - Correlation Coefficients between SKU

The correlation analysis was made for every SKU from the client's company, comparing them with each other and with products from other brands (from the same category and range). In the case that the compared products are direct competitors, the expected value for the correlation coefficient is positive. In Figure 24, the colored cells indicate where the coefficient is superior to 0.25. The reason for this barrier is to not exclude potential competitors (for instance, the existence of outliers like bargain sales in the considered period that affect

negatively the correlation) and guarantee that a positive correlation exists. By comparison of these data with the information gathered with the interviews, the direct competitors are selected by filtering those who do not have relevance in the market.

Having the competitors identified and their price history, it is possible to incorporate these variables in the regression models. Repeating the same process as before but now introducing the independent variable "competitor's price", the model stays:

$$Q = I + \beta_{price}\, P + \beta_{month}\, M + \beta_{fort}\, F + \beta_1\, C_1 + \beta_2\, C_2 + \ldots + \beta_n\, C_n$$

Where,

Q, is the quantity demanded

I, is the interception (constant)

β_{price}, is the price coefficient

β_{month}, is the month coefficient

β_{fort}, is the fortnight coefficient

β_i, is the price coefficient of the competitor i

P, is the price of the SKU

M, is the number of elapsed months

F, indicates the fortnight, and

C, is the competitor's price.

Using the "Microsoft Excel" tool to proceed to the "crossed" regression analysis, Figure 25 displays a few results obtained.

Characteristics	β Coefficients							Competitor's price				
Product	Intercepto	ppp	ppp_comp1	ppp_comp2	t_pnielsen	fortnight	Org Price	Competitor 1	Competitor 2	tpnielsen	fortnight	Q
‹150	90552.461	-3036.452	88.302	499.713	1511.949	6559.410	25.52	33.9	31.05	10.00	0.00	46,691
‹150	40051.930	-1262.840	42.677	224.622	551.444	3647.901	25.66	36.51	31.05	10.00	0.00	21,695
CE 400	42180.599	-1575.068	330.809		-150.822	2975.506	10.00	10	0	4.00	0.00	29,135

Figure 25 - Example of the results obtained with the crossed approach

Concerning the first row of results, for a price of $25.52 MXN is expected a demand of 46691 units when the two main competitors' prices are $33.90 MXN and $31.05 MXN.

Recovering the example of "*sku x*", the correlation analysis identified one main competitor "comp Y" in this specific market format (Annex E: "sku x" Data Series). Having the price variable of the competitor, the "crossed" regression analysis can be applied. Using as

dependent variable the quantity demanded of the "*sku x*" and as prediction variables price, competitor's price, "t_pnielsen" and "fortnight", Figure 26 shows the output of the crossed regression.

Regression Statistics	
Multiple R	0.85868532
R Square	0.73734047
Adjusted R Squared	0.70450803
Std Error	241.692431
Observations	37

	Coefficients	*tandard Erro*	*t Stat*	*p-value*
Intercept	7770.9736	1244.27156	6.24539999	5.3443E-07
sku x	-299.786376	51.1329587	-5.86287952	1.6149E-06
Comp Y	52.7399249	15.4638531	3.41052935	0.00177214
t_pnielsen	10.7118826	21.6687053	0.49434807	0.62443716
fortnight	171.822389	82.4258112	2.08457019	0.04517328

Figure 26 - "sku x" crossed regression analysis output

Analyzing the coefficient values, the price coefficient maintains its negative weight over the demand, while the competitor's price produces the reverse effect. In this case, a positive coefficient indicates that an increment in the price of "Comp Y" generates an increase in the "*sku x*" demand. Evaluating the validity of this regression, the adjusted R^2 respects the condition planted, while the significance level condition is accomplished for price, competitor's price and "fortnight".

This approach already reflects the influence of the competition in the calculation of the demand, but there are cases where the difference in price to the main competitors it's only relevant in some particular price ranges. For instance, the situation where two products from two distinct brands both change prices, the difference in value between them can be relevant or not for the consumer when has to make its choice. So as to identify how much the difference in price between the client's product and its competitors affects the demand, a third approach was designed. For these models, the regression analysis will be applied, this time to calculate the coefficients for the price differentials. The general form is:

$$Q = I + \beta_{month}\, M + \beta_{fort}\, F + \beta_{dif1}\,(P - C_1) + \beta_{dif2}\,(P - C_2) + \ldots + \beta_{dif\,n}\,(P - C_n)$$

Where,

Q, is the quantity demanded

I, is the interception (constant)

β_{month}, is the month coefficient

β_{fort}, is the fortnight coefficient

$\beta_{dif\,i}$, is the price differential coefficient of the competitor i

P, is the price of the SKU

M, is the number of elapsed months

F, indicates the fortnight, and

C, is the competitor's price.

Considering these variables and adopting the same procedure to calculate the coefficients, the Figure 27 displays examples of the outcome obtained with the "differential" regression.

Details		β Coefficients						Competitor's Price		Differential		
Product	Category	Intercepto	Differential	Differential	t_pnielsen	fortnight	Org Price	Competitor 1	Competitor 2	Competitor 1	Competitor 2	Q
:150	Tocador	30221.40919	987.4072019	910.9384581	6093.539524	1679.995971	25.52	31.05	36.51	5.53	10.99	106,628
:150	Tocador	16256.24682	444.8749937	228.9879737	573.8979783	3427.087212	25.66	31.05	36.51	5.39	10.85	26,878
CE 400	Lavandería	27734.62251	262.6286629		-364.406727	3125.994791	10.00	10	0	0	0	26,277
:150	Tocador	305.630406	3.518752376		11.44279516		26.90	35.86	0	8.96	0	452

Figure 27 - Example of the results obtained with the differential approach

Taking as reference the first row of results, for that product in a specific market format, a price of $25.52 MXN expects a demand of 106628 units.

Retrieving the "*sku x*" data, for the differential approach will be considered three distinct variables: price differential between the company's SKU and competitor's, "t_pnielsen" and "fortnight". Regarding the price differential variable, the coefficient is projected to be positive. As the difference in price varies, the "*sku x*" demand is expected to vary in the same direction. Figure 28 displays the results of this third approach.

Regression Statistics	
Multiple R	0.70490073
R Square	0.49688504
Adjusted R Squared	0.45114731
Std Error	329.395839
Observations	37

	Coefficients	*tandard Erro*	*t Stat*	*p-value*
Intercept	1054.24439	123.407253	8.54280731	7.1494E-10
Differential	35.4223552	20.6192	1.71793063	0.0951806
t_pnielsen	86.6622144	22.5027753	3.85117895	0.00051227
fortnight	265.519814	109.830318	2.41754571	0.02131108

Figure 28 - "sku x" differential regression analysis output

Despite of the p-values fitness in the restriction imposed in level of significance, this model is considered invalid as the adjusted R^2 doesn't accomplish the minimum value of 50%.

Have run out these three approaches without fulfilling all the stipulated restrictions, "*sku x*" in the "Soriana – Hiper" will not be considered for the preliminary implementation. However, this SKU in this specific market will not be discarded. These approaches will be tested with the updated data and new approaches will be created by adjusting the variables in order to fit more accurately the demand behavior.

In the case which one or more of the approaches is statistically validated, it is necessary to check which one of them reflects more accurately the real market.

4.3 Models Selection

Once the mathematical models are statistically validated, it is essential to select from the available approaches for each SKU the option that can consistently produce results with more "business sense".

Yearly, the client company defines the goals of sales volume and revenue for the subsequent years. For the next twelve months, the company aims to gain market share and a growth in terms of sales volume (in tons) of 5.5% considering the toilet soaps category and a 6.4% increase in the detergents category. Bearing this and the validated mathematical models in mind, it was calculated the price that allowed that demand growth for every SKU concerning all the formats of the market where they are sold. So, for all the client products in the toilet soaps category it was calculated the price that would generate a 5.5% increase in the demand and for the detergents category products a 6.4% rise.

Regarding the consumer goods market, in terms of pricing, is more likely to achieve an increment in the demand with price reductions. Nevertheless, the possibility of still reducing price but generating bigger total revenues it is more appealing. Keeping in mind the concept of elasticity presented earlier in the previous chapter (page 15) and in this section (page 34), Figure 29 displays the calculated elasticity considering SKU, market formats and the variation needed in price in order to achieve the wanted demand increment. Using the three distinct approaches for the models construction (linear, crossed and differential), it was calculated the elasticity that each of the models attributed to each SKU in a given market format as well the price variation necessary to accomplish the goal of market share growth.

			Elasticity			% Price			
Group	Format	Product	Linear	Crossed	Differential	Linear	Crossed	Differential	Selected Model
Casa Ley	Fiesta Europea	150	-1.84	-2.01	-0.14	-3%	-3%	-39%	Crossed
Casa Ley	Fiesta Europea	150	-2.22	-2.37	-0.22	-2%	-2%	-25%	Crossed
Casa Ley	Fiesta Europea	90	-1.11			-5%			Linear
Casa Ley	Fiesta Europea	90	-3.92			-1%			Linear
Casa Ley	Fiesta Europea		-19.08			0%			Linear
Casa Ley	Fiesta Europea	E 400	-6.44		-4.78	-1%		-1%	Differential
Casa Ley	Compacto/Expre	90	-0.76			-7%			Linear
Casa Ley	Compacto/Expre	90	-3.94			-1%			Linear
Casa Ley	Compacto/Expre	150	-2.83	-3.05	-0.26	-2%	-2%	-22%	Crossed
Casa Ley	Compacto/Expre	150	-2.46	-2.72	-0.16	-2%	-2%	-35%	Crossed

Figure 29 - Example of the calculated elasticities and price variations

Taking into account the first row of results, by means of the linear approach (the one without information about competitors) it was calculated an elasticity of -1.84 for that SKU in "Casa Ley – Fiesta Europea". Using the crossed regression (the approach where the price of the competitors is considered in the equation) the elasticity calculated was -2.01 for the same

SKU in the same circumstances, while with the differential approach (price differential between the client product and its main competitors) the rate was -0.14. Regarding the price variation, in order to achieve the goal of 5.5% growth in terms of sales volume in tons, the linear model deemed necessary a 3% decrease in price, while the crossed and the differential estimated a 3% and a 39% reduction, respectively.

The last column of the figure indicates which of the models was selected from the results of elasticity and price variations. The blank cells refer to situations where whether the mathematical models were not validated statistically by the criteria stated previously or no relevant direct competitors were identified. The process of selection of the models followed two conditions:

1. Models with absolute elasticities smaller than 1, lose priority;
2. Priority to the models that include the variable competitors' price (preferably the differential approach and then the crossed models).

In the case when there is only one model for selection, the model available is selected by default. Given the situation when all the available models have absolute elasticities smaller than 1, the one that has the biggest absolute value is chosen. For example, applying this decision process to the first row of results of Figure 29, the selected approach for that specific SKU in that market format, is the "crossed" model. Running the first step of selection, the differential model is discarded because its absolute elasticity value is smaller than 1. Applying the second step, where the priority is given to the models that include the competitors' information, the crossed model is picked over the linear.

5. Results & Conclusions

From the over 2000 models evaluated with the most representatives SKU and concerning the different groups and formats of the markets, 44 models for the wholesale market and 98 for the retail market were selected as valid.

Apart from using variables considering price per own products and per relevant competitor SKU, other variables were taken into account to reflect the effects of the market tendencies and seasonality. The SKU contemplated for this study had negative (concerning the linear and crossed approaches) and positive (differential method) correlations and a relevant significance in the models.

The models selected for this revenue management project suggested price reductions in the distinct points of sale and were suitable with the strategy "Road to Market" designed by the client company jointly with Aurigam. With these price cutbacks, the goals are to reach a volume of sales that accomplishes the forecasts for the following year, to determine the inferior boundaries of net profit for the several products and to avoid collateral effects in the negotiations with the big market chains that are usually affected when price raise decisions are taken.

All the results produced with the selected models were contrasted with the commercial policy of the company, reflect the price indexes of the distinct market chains and assure that the minimum price margins are fulfilled.

The reduced number of validated models, when compared with the total produced, indicates that the method chosen to generate the preliminary models doesn't fit to the majority of the cases. For future works it is important to evaluate the quality of the created variables and adjust them. Also, it would be significant to elaborate different generic approaches and introduce other variables for the distinct types of products and SKU: it is reasonable to think that the purchasing influencers are different for toilet soap and detergent products. In addition, a non-linear regression approach could be considered in attempt to match the price-demand relationship in SKU without linear behavior.

Globally, it was previously forecasted a volume of sales, in tons, of 24,180 in the following year (844 tons per month considering the market conditions static and the months flat). If the validated models were implemented with the price modifications proposed, according to its results, it is forecasted a total volume of 27,149 tons per year (941 tons per month with the

same considerations mentioned before). The confirmation of these predictions, would proportionate a 12.27% total growth in volume of sales (Figure 30).

Considering the retail market, is expected an additional volume of sales of 11.3% (from the actual 9,921 to 11,040) in terms of tons, when compared the forecasts of the actual policy with the new one (Figure 31). These modifications are projected to produce as well an impact in the collected profit, moving from the actual $7,478,623 MXN to $7,636,311 MXN (2.1% positive variation). Referring the wholesale market, the forecasts with the actual policy point for 10,997 tons of sales volume in the following year, while the predictions with the implementation of the new proposition aim to the 12,620 tons (a 14.75% growth), as presented in Figure 32.

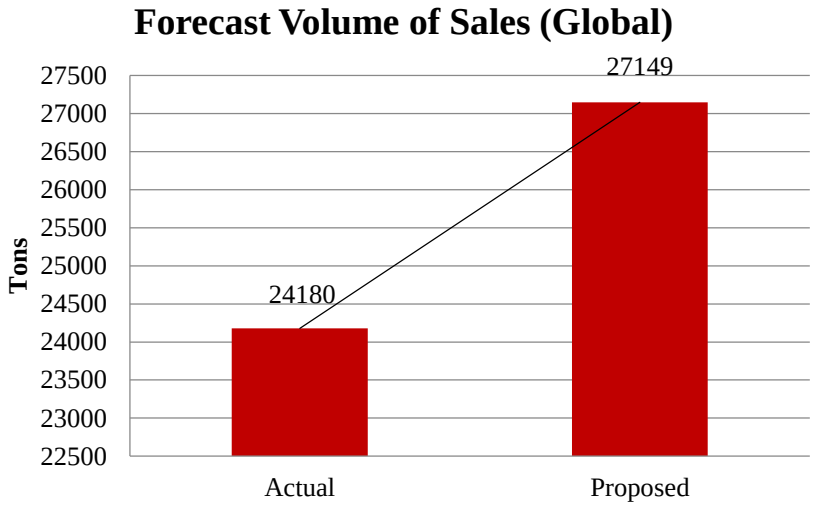

Figure 30 - Comparison of the forecast of volume of sales in tons (global)

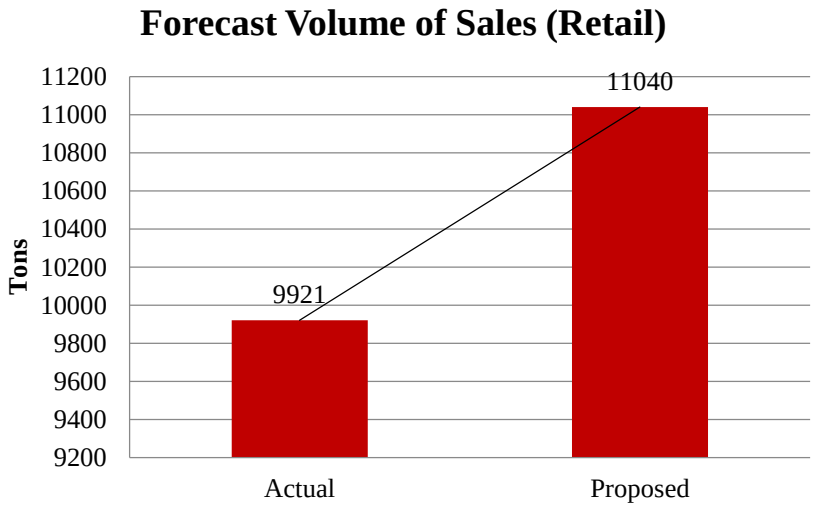

Figure 31 - Comparison of the forecast of volume of sales in tons (retail market)

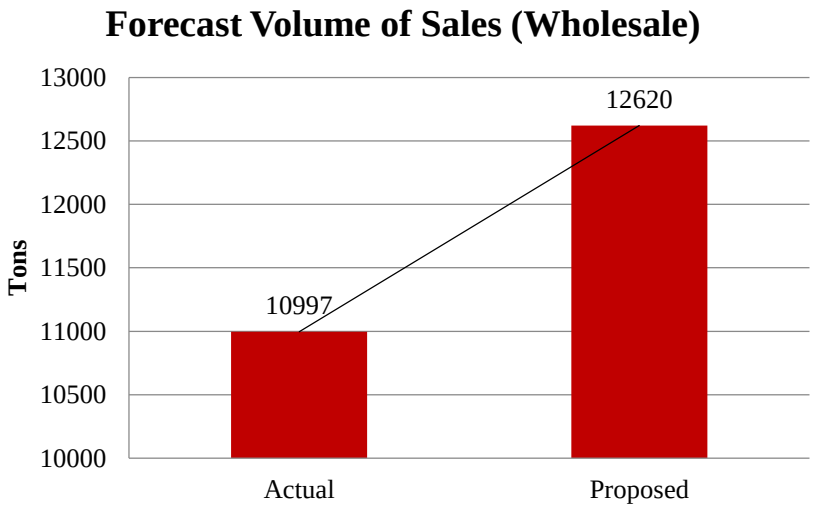

Figure 32 - Comparison of the forecast of volume of sales in tons (wholesale)

Taking into account the different categories, the general variation in volume of sales provoked by the propositions of price modification considering the retail market are presented in the Table 3 (monthly figures).

Table 3 - Sales volume variation per category (retail market)

Category	Tons				Revenue				Profit			
	Proposed	Actual	%	Impact	Proposed	Actual	%	Impact	Proposed	Actual	%	Impact
Toilet Soaps	391	366	↑ 7%	25	13,854,308	13,377,790	↑ 4%	476,518	4,720,698	4,840,827	↓ -2%	-120,129
Detergents	389	321	↑ 21%	68	5,491,254	4,676,219	↑ 17%	815,035	1,844,323	1,666,145	↑ 11%	178,178
Laundry	139	139	↓ 0%	0	3,157,612	3,059,756	↑ 3%	97,856	1,071,021	971,381	↑ 10%	99,640
Total	920	827	↑11.3%	93	22,503,174	21,113,765	↑ 7%	1,389,409	7,636,042	7,478,353	↑ 2.1%	157,689

From Table 3 it is possible to understand that in the toilet soaps category, despite of the increment in volume in tons and in revenue, the profits would decrease 2% with the suggested modifications. However in the detergents and laundry categories, the profits would raise 11% and 10% respectively, according to the results of the validated models.

Looking into the categories, the Table 4 and Table 5 display the expected impact with the new strategy for the several SKU (their names are omitted for matters of confidentiality) in the categories “Toilet Soaps” and “Detergents” in the retail market.

In the case of the toilet soaps products, a price reduction produces a relatively strong impact in the profits of a few SKU, with a special attention to “*sku 1*” and “*sku 6*” that represent a very important portion in the earnings obtained with this category. From these results, it can be inferred that with the actual situation, the company is already collecting interesting profit margins per unit of product. The decision of implementation of the suggested price changes in

this category has to be weighted if it is worth the cost of "buying" a 7% growth in sales volume.

Table 4 - Sales volume variation per SKU – Toilet Soaps (retail market)

Category	Product	Tons				Revenue				Profit			
		Proposed	Actual	%	Impact	Proposed	Actual	%	Impact	Proposed	Actual	%	Impact
Toilet Soaps	*sku 1*	92	87	5%	5	3,242,491	3,149,612	3%	92,879	1,180,291	1,193,656	-1%	-13,365
	sku 2	14	8	64%	5	530,698	386,967	37%	143,731	188,098	178,045	6%	10,053
	sku 3	16	17	-6%	-1	583,898	610,998	-4%	-27,100	211,014	212,280	-1%	-1,266
	sku 4	5	4	8%	0	158,738	168,367	-6%	-9,629	51,045	68,851	-26%	-17,806
	sku 5	24	22	9%	2	836,494	807,319	4%	29,175	264,228	283,080	-7%	-18,852
	sku 6	182	173	5%	9	6,397,417	6,226,759	3%	170,658	2,151,118	2,190,707	-2%	-39,589
	sku 7	15	11	41%	4	581,156	492,690	18%	88,466	200,342	223,181	-10%	-22,839
	sku 8	27	28	-3%	-1	951,197	961,187	-1%	-9,990	317,540	308,342	3%	9,198
	sku 9	2	2	17%	0	76,431	75,817	1%	614	24,397	31,203	-22%	-6,806
	sku 10	14	14	5%	1	495,787	498,075	0%	-2,288	132,626	151,483	-12%	-18,857
Total	Total	391	366	7%	25	13,854,308	13,377,790	4%	476,518	4,720,699	4,840,828	-2%	-120,129

Table 5 - Sales volume variation per SKU – Detergents (retail market)

Category	Product	Tons				Revenue				Profit			
		Proposed	Actual	%	Impact	Proposed	Actual	%	Impact	Proposed	Actual	%	Impact
Detergents	*sku 11*	228	191	19%	37	3,382,082	2,948,172	15%	433,910	1,175,591	1,097,416	7%	78,175
	sku 12	161	130	24%	31	2,109,172	1,728,048	22%	381,124	668,732	568,729	17%	100,003
Total	Total	389	321	21%	68	5,491,254	4,676,219	17%	815,035	1,844,323	1,666,145	10%	178,178

Next Steps

Having the models chosen and the predictions of the impact that the changes may generate, the following step is to proceed to the implementation. From the models available, the ones with more statistical validity should be selected for a factorial experiment. The potential impact should be evaluated as well so it can be possible to delineate reachable goals. With the SKU and market formats selected for the factorial experiment, the competitors must be tracked before, during and after the experiment to evaluate the "crossed" effect of the competition. Additionally it is necessary to assure that the suggested price is practiced in the points of sale and that the final consumer perceives the changes in price, and attempt to stock ruptures or supply shortages to isolate the effect. While measuring the results, it is important to update the data with the information gathered to reunite a statistical base more effective and if necessary adjust the less accurate models with the new numbers. The main goal of this phase is to attain that the expected impact is accomplished in terms of tendencies and magnitudes, and for the potential deviations that may surge, is essential to understand their causes and correct them. Considering the structure of the company, it is compulsory that the practices of revenue management are maintained and the temptation of returning to the old

way of pricing is avoided. For that, revenue management has to be a recurrent practice within the company and goals in terms of deadlines and quality of data should be set.

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Annex A: Gantt Diagram of the Activities

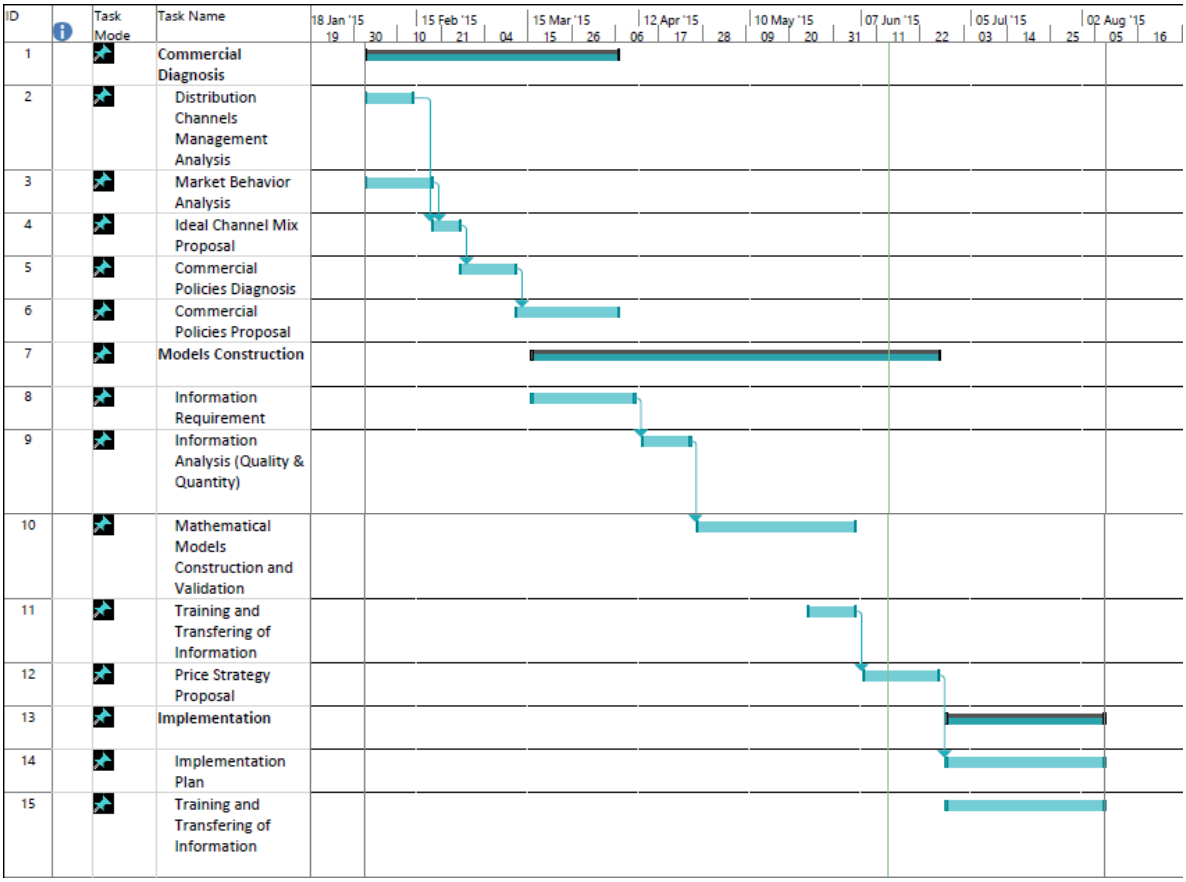

Figure 1 - Gantt Diagram of the Activities

Annex B: Wholesale market (Models Results)

Table 1- Prices per Wholesale format

PURE RM

Cathegory	SKU	Wholesale						Casa Ley			AS - Mayoreo
		Abeja		Casa Chapa	Grupo Z	Duero	Ibarra	Ley Ruta	Ley Mayoreo	LeySuper Mayoreo	Duero
Tocador	CONFIDENTIAL	$ 7,28	1,50		$ 7,51		$ 7,80				
					$ 6,05		$ 6,17	$ 6,54	$ 6,57	$ 6,53	$ 7,07
					$ 3,94		$ 4,34	$ 4,72			
					$ 7,78		$ 8,80				
							$ 6,36	$ 6,65			$ 6,73
									$ 4,44		$ 5,03
Detergentes					$ 15,29	$ 15,43	$ 16,95	$ 15,80	$ 14,61	$ 16,18	$ 16,65
				$128,88	$128,22		$135,06				
		$145,98			$134,55	$141,44	$147,35	$132,21		$146,77	
Lavandería		$ 10,31			$ 10,40	$ 9,32	$ 10,36			$ 11,03	$ 10,36
		$ 10,67				$ 10,24					

Table 2- Prices Variation per Wholesale format

DELTA Price

Cathegory	SKU	Wholesale						Casa Ley			AS - Mayoreo
		Abeja		Casa Chapa	Grupo Z	Duero	Ibarra	Ley Ruta	Ley Mayoreo	LeySuper Mayoreo	Duero
	CONFIDENTIAL				-10%		-11%				
					-1%		-6%	-8%	-8%	-10%	1%
					-7%		-3%	-3%			
					-9%		1%				
							-3%	-10%			-3%
									-3%		5%
Detergentes					-8%	-1%	1%	-10%	-10%	-7%	-1%
				-8%	-4%		-1%				
		1%			-6%	1%	-3%	-10%		-2%	
Lavandería		5%			-4%	-2%	-2%			-8%	-2%
		5%				-4%					

Table 3- Quantity Variation per Wholesale format

DELTA Quantity

Cathegory	SKU	Wholesale						Casa Ley			AS - Mayoreo
		Abeja		Casa Chapa	Grupo Z	Duero	Ibarra	Ley Ruta	Ley Mayoreo	LeySuper Mayoreo	Duero
	CONFIDENTIAL				↑115%		↑88%				
					↑ 4%		↑37%	↑55%	↑20%	↑70%	↓ -4%
					↑120%		↑12%	↑15%			
					↑ 98%		↓ -1%				
							↑14%	↑20%			↑ 24%
									↑10%		↓ -2%
Detergentes					↑48%	↑ 2%	↓ -3%	↑56%	↑90%	↑31%	↑ 2%
				↑ 50%	↑21%		↑ 2%				
		↓ -4%			↑54%	↓ -1%	↑10%	↑156%		↑10%	
Lavandería		↓ -1%			↑24%	↑16%	↑11%			↑65%	↑ 11%
		↓ -3%				↑38%					

Table 4- Profit Variation per Wholesale format

DELTA Profit

Cathegory	SKU	Wholesale						Casa Ley			AS - Mayoreo
		Abeja		Casa Chapa	Grupo Z	Duero	Ibarra	Ley Ruta	Ley Mayoreo	LeySuper Mayoreo	Duero
	CONFIDENTIAL				↑40%		↑28%				
					↑ 0%		↑ 8%	↑14%	↑18%	↑20%	↑ 1%
					↑42%		↑ 1%	↑ 2%			
					↑32%		↑ 1%				
							↑ 2%	↑20%			↑ 4%
									↑ 8%		↑ 29%
Detergentes					↑12%	↑ 1%	↑ 1%	↑15%	↑29%	↑ 6%	↑ 1%
				↑ 12%	↑ 3%		↑ 1%				
		↑ 0%			↑14%	↑ 1%	↑ 1%	↑59%		↑ 1%	
Lavandería		↑ 36%			↑ 4%	↑ 2%	↑ 1%			↑52%	↑ 1%
		↑ 33%				↑ 8%					

Annex C: Retail market (Models Results)

Table 5- Models Results (Bodega)

Cathegory	Product	Bodega																
		Price				Quantity			Revenue			Profit					Margin	Con. Price
		Proposed	Original	%	PPK Prop.	Proposed	Original	%	Proposed	Original	%	Proposed	Original	%	Popt	% Util Opt		
Tocador	CONFIDENTIAL	24,90	25,66	-3%	41,50	98 169	94 010	4%	2 023 966	1 997 379	1%	702 613	732 005	-4%	26,94	6%	17,2%	19,60
		4,29	4,50	-5%	42,90	213 100	194 644	9%	756 957	725 242	4%	253 269	265 178	-4%	4,73	-5%	17,2%	3,32
		24,90	25,52	-2%	41,50	210 487	202 329	4%	4 339 642	4 275 316	2%	1 392 708	1 442 597	-3%	26,80	6%	17,2%	19,60
		8,50	7,90	8%	42,50	32	37	-13%	224	239	-6%	73	66	11%	8,30	-9%	17,2%	6,64
		4,29	4,50	-5%	42,90	105 784	101 004	5%	375 756	376 341	0%	107 264	119 980	-11%	4,73	1%	17,2%	3,32
Total	Total								7 496 546	7 374 517	2%	2 455 927	2 559 826	-4%				

Cathegory	Product	Bodega																
		Price				Quantity			Revenue			Profit					Margin	Con. Price
		Proposed	Original	%	PPK Prop.	Proposed	Original	%	Proposed	Original	%	Proposed	Original	%	Popt	% Util Opt		
Detergentes																		
		159,90	162,01	-1%	15,99	11 049	9 788	13%	1 475 205	1 324 087	11%	488 078	449 619	9%	144,95	19%	16,5%	113,95
Total	Total								1 475 205	1 324 087	11%	488 078	449 619	9%				

Cathegory	Product	Bodega																
		Price				Quantity			Revenue			Profit					Margin	Con. Price
		Proposed	Original	%	PPK Prop.	Proposed	Original	%	Proposed	Original	%	Proposed	Original	%	Popt	% Util Opt		
Lavandería																		
		10,90	10,00	9%	27,25	120 108	126 250	-5%	1 111 489	1 071 867	4%	388 671	312 081	25%	10,50	-2%	15,1%	8,68
Total	Total								1 111 489	1 071 867	4%	388 671	312 081	25%				

Table 6- Models Results (Supercenter)

Cathegory	Product	Supercenter																
		Price				Quantity			Revenue			Profit					Margin	Con. Price
		Proposed	Original	%	PPK Prop.	Proposed	Original	%	Proposed	Original	%	Proposed	Original	%	Popt	% Util Opt		
Tocador	CONFIDENTIAL	25,90	25,90	0%	43,17	22 648	22 648	0%	483 929	483 929	0%	179 088	179 088	0%	27,20	7%	17,5%	19,60
		8,80	8,50	4%	44,00	7 473	11 516	-35%	54 254	80 754	-33%	20 012	27 988	-28%	7,59	18%	17,5%	6,64
		25,90	25,90	0%	43,17	38 052	38 052	0%	813 082	813 082	0%	280 328	280 328	0%	27,20	7%	17,5%	19,60
		8,80	8,50	4%	44,00	46 263	49 468	-6%	335 868	346 891	-3%	116 751	112 595	4%	8,93	-9%	17,5%	6,64
Total	Total								1 687 133	1 724 656	-2%	596 179	599 999	-1%				

Cathegory	Product	Supercenter																
		Price				Quantity			Revenue			Profit					Margin	Con. Price
		Proposed	Original	%	PPK Prop.	Proposed	Original	%	Proposed	Original	%	Proposed	Original	%	Popt	% Util Opt		
Detergentes																		
		17,49	17,90	-2%	17,49	95 343	93 941	1%	1 387 399	1 399 039	-1%	464 501	489 714	-5%	18,80	3%	16,8%	11,88
Total	Total								1 387 399	1 399 039	-1%	464 501	489 714	-5%				

Cathegory	Product	Supercenter																
		Price				Quantity			Revenue			Profit					Margin	Con. Price
		Proposed	Original	%	PPK Prop.	Proposed	Original	%	Proposed	Original	%	Proposed	Original	%	Popt	% Util Opt		
Lavandería																		
		11,50	10,90	6%	28,75	58 678	64 201	-9%	570 880	592 024	-4%	217 750	205 656	6%	11,45	-8%	15,4%	8,68
Total	Total								570 880	592 024	-4%	217 750	205 656	6%				

Table 7- Models Results (Fiesta Europea)

Cathegory	Product	Fiesta Europea																
		Price				Quantity			Revenue			Profit					Margin	Con. Price
		Proposed	Original	%	PPK Prop.	Proposed	Original	%	Proposed	Original	%	Proposed	Original	%	Popt	% Util Opt		
Tocador	CONFIDENTIAL	26,90	28,22	-5%	44,83	2 503	2 253	11%	55 275	52 196	6%	21 587	21 872	-1%	27,79	14%	17,9%	20,55
		12,19	14,19	-14%	45,15	7 273	4 686	55%	72 788	54 596	33%	24 310	23 359	4%	12,74	24%	17,9%	9,66
		9,09	9,17	-1%	45,45	13 978	13 735	2%	102 536	101 639	1%	38 489	38 706	-1%	9,63	2%	17,9%	6,85
		6,90	7,89	-13%	46,00	4 314	3 802	13%	24 441	24 630	-1%	9 723	11 659	-17%	8,28	-13%	17,9%	5,12
		4,70	5,04	-7%	47,00	8 459	8 162	4%	29 899	30 934	-3%	9 904	11 642	-15%	5,29	10%	17,9%	3,41
		26,90	27,89	-4%	44,83	4 889	4 563	7%	107 969	104 482	3%	39 523	40 597	-3%	28,92	16%	17,9%	20,55
		12,19	14,19	-14%	45,15	8 710	7 535	16%	87 174	87 787	-1%	28 179	36 751	-23%	14,90	20%	17,9%	9,66
		9,09	9,32	-2%	45,45	17 531	17 252	2%	128 603	129 756	-1%	45 568	48 045	-5%	9,79	10%	17,9%	6,81
		6,90	8,06	-14%	46,00	3 364	2 996	12%	17 454	18 162	-4%	5 686	7 678	-26%	8,46	7%	17,9%	6,81
		4,70	5,04	-7%	47,00	6 430	6 125	5%	22 726	23 214	-2%	6 406	7 668	-16%	5,29	11%	17,9%	3,41
Total	Total								648 865	627 395	3%	229 374	247 978	-8%				

Cathegory	Product	Fiesta Europea																
		Price				Quantity			Revenue			Profit					Margin	Con. Price
		Proposed	Original	%	PPK Prop.	Proposed	Original	%	Proposed	Original	%	Proposed	Original	%	Popt	% Util Opt		
Detergentes		17,49	18,70	-6%	17,49	35 409	24 468	45%	542509,27	400811,86	35%	199 758	163 969	22%	16,23	30%	17,2%	12,84
		164,90	178,96	-8%	16,49	1 118	447	150%	152 675	66 306	130%	52 773	26 328	100%	152,12	155%	17,2%	119,91
Total	Total								695 184	467 118	49%	252 532	190 297	33%				

Cathegory	Product	Fiesta Europea																
		Price				Quantity			Revenue			Profit					Margin	Con. Price
		Proposed	Original	%	PPK Prop.	Proposed	Original	%	Proposed	Original	%	Proposed	Original	%	Popt	% Util Opt		
Lavandería		11,50	12,00	-4%	28,75	50 073	41 750	20%	484 854	421 840	15%	187 140	173 611	8%	10,99	-2%	15,8%	8,31
Total	Total								484 854	421 840	15%	187 140	173 611	8%				

Table 8- Models Results (Compacto/Express)

Cathegory	Product	Compacto/Express																
		Price				Quantity			Revenue			Profit					Margin	Con. Price
		Proposed	Original	%	PPK Prop.	Proposed	Original	%	Proposed	Original	%	Proposed	Original	%	Popt	% Util Opt		
Tocador	CONFIDENTIAL	26,90	26,91	0%	44,83	1 708	1 706	0%	37 714	37 686	0%	14 729	14 726	0%	25,61	17%	17,9%	20,55
		12,19	14,19	-14%	45,15	6 780	4 359	56%	67 854	50 781	34%	22 662	21 727	4%	12,73	24%	17,9%	9,66
		9,09	9,17	-1%	45,45	10 742	10 496	2%	78 797	77 676	1%	29 578	29 580	0%	9,14	0%	17,9%	6,85
		6,90	7,64	-10%	46,00	7 918	7 335	8%	41 085	42 143	-3%	14 074	17 120	-18%	8,02	8%	17,9%	5,12
		4,70	5,05	-7%	47,00	5 391	4 911	10%	19 053	18 649	2%	6 311	7 042	-10%	5,30	5%	17,9%	3,41
		26,90	26,96	0%	44,83	2 234	2 220	1%	49 328	49 141	0%	18 057	18 058	0%	26,49	16%	17,9%	20,55
		12,19	14,19	-14%	45,15	6 885	6 220	11%	68 909	72 467	-5%	22 275	30 337	-27%	14,90	22%	17,9%	9,66
		9,09	9,32	-2%	45,45	13 193	12 358	7%	96 781	92 950	4%	34 293	34 417	0%	9,30	0%	17,9%	6,81
		6,90	8,03	-14%	46,00	6 174	5 028	23%	32 034	30 363	6%	10 435	12 772	-18%	8,43	3%	17,9%	6,81
		4,70	5,04	-7%	47,00	5 669	5 293	7%	20 038	20 061	0%	5 648	6 626	-15%	5,29	9%	17,9%	3,41
Total	Total								511 592	491 917	4%	178 062	192 405	-7%				

Cathegory	Product	Compacto/Express																
		Price				Quantity			Revenue			Profit					Margin	Con. Price
		Proposed	Original	%	PPK Prop.	Proposed	Original	%	Proposed	Original	%	Proposed	Original	%	Popt	% Util Opt		
Detergente		17,49	18,78	-7%	17,49	51 396	36 864	39%	787 449	606 460	30%	289 948	249 625	16%	16,55	20%	17,2%	12,84
		164,90	179,00	-8%	16,49	438	302	45%	59 791	44 728	34%	20 667	17 766	16%	158,12	25%	17,2%	119,91
Total	Total								847 240	651 188	30%	310 615	267 391	16%				

Cathegory	Product	Compacto/Express																
		Price				Quantity			Revenue			Profit					Margin	Con. Price
		Proposed	Original	%	PPK Prop.	Proposed	Original	%	Proposed	Original	%	Proposed	Original	%	Popt	% Util Opt		
Lavandería		11,50	12,00	-4%	28,75	55 405	45 109	23%	536 490	455 778	18%	207 070	187 579	10%	10,83	3%	15,8%	8,31
Total	Total								536 490	455 778	18%	207 070	187 579	10%				

Table 9- Models Results (Fiesta Compacta)

Cathegory	Product	Fiesta Compacta																
		Price				Quantity			Revenue			Profit					Margin	Con. Price
		Proposed	Original	%	PPK Prop.	Proposed	Original	%	Proposed	Original	%	Proposed	Original	%	Popt	% Util Opt		
Tocador	CONFIDENTIAL	26,90	28,22	-5%	44,83	1 617	1 472	10%	35 720	34 103	5%	13 950	14 291	-2%	28,53	14%	17,9%	20,55
		12,19	14,19	-14%	45,15	5 672	4 012	41%	56 761	46 744	21%	18 957	19 999	-5%	13,34	17%	17,9%	9,66
		9,09	9,17	-1%	45,45	8 902	8 725	2%	65 300	64 564	1%	24 512	24 587	0%	9,39	0%	17,9%	6,85
		6,90	7,89	-13%	46,00	4 034	3 643	11%	20 931	21 612	-3%	7 170	9 186	-22%	8,28	7%	17,9%	5,12
		4,70	5,04	-7%	47,00	6 426	5 865	10%	22 711	22 228	2%	7 523	8 366	-10%	5,29	5%	17,9%	3,41
		26,90	27,89	-4%	44,83	2 926	2 753	6%	64 630	63 029	3%	23 658	24 491	-3%	29,28	18%	17,9%	20,55
		12,19	14,19	-14%	45,15	7 193	6 239	15%	71 986	72 685	-1%	23 269	30 428	-24%	14,90	20%	17,9%	9,66
		9,09	9,32	-2%	45,45	10 597	10 398	2%	77 733	78 205	-1%	27 543	28 957	-5%	9,79	9%	17,9%	6,81
		6,90	8,06	-14%	46,00	3 098	2 544	22%	16 076	15 420	4%	5 237	6 519	-20%	8,46	3%	17,9%	6,81
		4,70	5,04	-7%	47,00	6 896	6 206	11%	24 375	23 523	4%	6 871	7 770	-12%	5,29	6%	17,9%	3,41
Total	Total								456 224	442 112	3%	158 691	174 594	-9%				

Cathegory	Product	Fiesta Compacta																
		Price				Quantity			Revenue			Profit					Margin	Con. Price
		Proposed	Original	%	PPK Prop.	Proposed	Original	%	Proposed	Original	%	Proposed	Original	%	Popt	% Util Opt		
Detergentes		17,49	18,70	-6%	17,49	26 901	18 839	43%	412157,90	308598,20	34%	151 761	126 245	20%	16,29	27%	17,2%	12,84
		164,90	178,96	-8%	16,49	1 027	622	65%	140 267	92 169	52%	48 485	36 597	32%	153,26	48%	17,2%	119,91
Total	Total								552 425	400 768	38%	200 246	162 842	23%				

Cathegory	Product	Fiesta Compacta																
		Price				Quantity			Revenue			Profit					Margin	Con. Price
		Proposed	Original	%	PPK Prop.	Proposed	Original	%	Proposed	Original	%	Proposed	Original	%	Popt	% Util Opt		
Lavandería		11,50	12,00	-4%	28,75	31 638	30 336	4%	306 355	306 516	0%	118 245	126 149	-6%	12,92	-1%	15,8%	8,31
Total	Total								306 355	306 516	0%	118 245	126 149	-6%				

Table 10- Models Results (Hiper)

Cathegory	Product	Híper																
		Price				Quantity			Revenue			Profit					Margin	Con. Price
		Proposed	Original	%	PPK Prop.	Proposed	Original	%	Proposed	Original	%	Proposed	Original	%	Popt	% Util Opt		
Tocador	Neutro 4x150	26,50	27,30	-3%	44,17	7 714	6 675	16%	168 445	150 152	12%	64 613	60 308	7%	24,00	32%	17,6%	20,42
	Neutro 3x90	12,00	14,79	-19%	44,44	13 513	9 191	47%	133 613	112 013	19%	43 544	50 749	-14%	14,22	12%	17,6%	9,60
	Neutro 200	8,90	8,54	4%	44,50	22 124	23 231	-5%	157 840	159 034	-1%	56 467	52 588	7%	8,97	9%	17,6%	6,77
	Neutro 150																	
	Neutro 100																	
	Derma 4x150	26,50	27,20	-3%	44,17	13 749	12 255	12%	300 231	274 671	9%	107 732	103 092	5%	24,57	26%	17,6%	20,42
	Derma 3x90	12,00	14,79	-19%	44,44	15 615	10 281	52%	154 400	125 293	23%	48 642	55 662	-13%	14,00	13%	17,6%	9,60
	Derma 200	8,90	8,52	4%	44,50	28 887	29 883	-3%	206 091	204 095	1%	69 271	62 557	11%	8,95	12%	17,6%	6,77
	Derma 150																	
	Derma 100	4,60	4,85	-5%	46,00	18 303	17 926	2%	63 135	65 196	-3%	16 681	19 698	-15%	5,09	14%	17,6%	3,39
Total	Total								1 183 756	1 090 454	9%	406 949	404 653	1%				

Cathegory	Product	Híper																
		Price				Quantity			Revenue			Profit					Margin	Con. Price
		Proposed	Original	%	PPK Prop.	Proposed	Original	%	Proposed	Original	%	Proposed	Original	%	Popt	% Util Opt		
Detergentes	Util 1	17,79	18,30	-3%	17,79	11 334	10 611	7%	175 008	168 541	4%	65 293	65 825	-1%	18,47	0%	16,9%	12,72
	Util 10																	
Total	Total								175 008	168 541	4%	65 293	65 825	-1%				

Cathegory	Product	Híper																
		Price				Quantity			Revenue			Profit					Margin	Con. Price
		Proposed	Original	%	PPK Prop.	Proposed	Original	%	Proposed	Original	%	Proposed	Original	%	Popt	% Util Opt		
Lavandería	Amarillo SE 400																	
	Amarillo CE 400	11,70	10,90	7%	29,25	8 140	9 788	-17%	80 473	90 153	-11%	31 488	31 248	1%	11,71	-20%	15,5%	8,36
Total	Total								80 473	90 153	-11%	31 488	31 248	1%				

Table 11- Models Results (Súper)

Cathegory	Product	Price				Quantity			Revenue			Profit					Margin	Con. Price
		Proposed	Original	%	PPK Prop.	Proposed	Original	%	Proposed	Original	%	Proposed	Original	%	Popt	% Util Opt		
Tocador	CONFIDENTIAL	26,50	27,90	↓ -5%	44,17	1 703	1 493	↑ 14%	37 194	34 319	↑ 8%	14 267	14 226	↑ 0%	26,70	↑ 13%	17,6%	20,42
		12,00	14,78	↓ -19%	44,44	1 467	1 065	↑ 38%	14 501	12 969	↑ 12%	4 726	5 871	↓ -20%	14,93	↑ 11%	17,6%	9,60
		8,90	8,52	↑ 4%	44,50	6 624	6 945	↓ -5%	47 260	47 433	↓ 0%	16 907	15 610	↑ 8%	8,95	↑ 9%	17,6%	6,77
		26,50	27,75	↓ -5%	44,17	2 869	2 400	↑ 20%	62 639	54 872	↑ 14%	22 477	21 275	↑ 6%	25,17	↑ 23%	17,6%	20,42
		12,00	14,78	↓ -19%	44,44	1 369	1 048	↑ 31%	13 535	12 763	↑ 6%	4 264	5 665	↓ -25%	15,52	↑ 13%	17,6%	9,60
		8,90	8,52	↑ 4%	44,50	7 098	7 583	↓ -6%	50 640	51 791	↓ -2%	17 021	15 874	↑ 7%	8,95	↑ 8%	17,6%	6,77
Total	Total								225 769	214 147	↑ 5%	79 662	78 521	↑ 1%				

Cathegory	Product	Súper																
		Price				Quantity			Revenue			Profit					Margin	Con. Price
		Proposed	Original	%	PPK Prop.	Proposed	Original	%	Proposed	Original	%	Proposed	Original	%	Popt	% Util Opt		
Detergentes		17,79	19,29	↓ -8%	17,79	868	720	↑ 21%	13 408	12 046	↑ 11%	5 002	5 082	↓ -2%	18,85	↑ 0%	16,9%	12,72
Total	Total								13 408	12 046	↑ 11%	5 002	5 082	↓ -2%				

Cathegory	Product	Súper																
		Price				Quantity			Revenue			Profit					Margin	Con. Price
		Proposed	Original	%	PPK Prop.	Proposed	Original	%	Proposed	Original	%	Proposed	Original	%	Popt	% Util Opt		
Lavandería		11,70	10,90	↑ 7%	29,25	4 725	5 267	↓ -10%	46 710	48 510	↓ -4%	18 277	16 814	↑ 9%	12,00	↓ -12%	15,5%	8,36
Total	Total								46 710	48 510	↓ -4%	18 277	16 814	↑ 9%				

Table 12- Models Results (Chedrauí)

Cathegory	Product	Chedraui																
		Price				Quantity			Revenue			Profit					Margin	Con. Price
		Proposed	Original	%	PPK Prop.	Proposed	Original	%	Proposed	Original	%	Proposed	Original	%	Popt	% Util Opt		
Tocador	CONFIDENTIAL	25,90	28,54	↓ -9%	43,17	8 050	5 198	↑ 55%	171 790	122 241	↑ 21%	63 443	52 276	↑ 21%	24,73	↑ 29%	17,6%	19,74
		11,80	13,70	↓ -14%	43,70	4 840	2 070	↑ 134%	47 065	23 372	↑ 101%	14 801	9 572	↑ 55%	11,65	↑ 62%	17,6%	9,28
		6,70	7,90	↓ -15%	44,67	13 836	13 080	↑ 6%	76 385	85 146	↓ -10%	29 187	40 526	↓ -28%	8,30	↓ -18%	17,6%	4,94
		4,50	5,20	↓ -13%	45,00	6 903	6 379	↑ 8%	22 521	24 050	↓ -6%	6 205	8 972	↓ -31%	5,46	↑ 10%	17,6%	3,27
		25,90	28,30	↓ -8%	43,17	12 388	9 849	↑ 26%	264 385	229 668	↓ -1%	90 942	91 778	↓ -1%	27,18	↑ 5%	17,6%	19,74
		11,80	13,83	↓ -15%	43,70	6 055	2 846	↑ 113%	58 874	32 436	↑ 82%	17 864	13 158	↑ 36%	11,87	↑ 42%	17,6%	9,28
Total	Total								641 020	516 912	↑ 24%	222 442	216 282	↑ 3%				

Cathegory	Product	Chedraui																
		Price				Quantity			Revenue			Profit					Margin	Con. Price
		Proposed	Original	%	PPK Prop.	Proposed	Original	%	Proposed	Original	%	Proposed	Original	%	Popt	% Util Opt		
Detergentes		17,49	17,99	↓ -3%	17,49	4 707	4 054	↑ 16%	69973,69	61981,72	↑ 13%	24 413	22 739	↑ 7%	16,23	↑ 15%	16,9%	12,46
		164,90	169,36	↓ -3%	16,49	2 490	1 817	↑ 37%	341 275	255 729	↑ 33%	118 771	93 390	↑ 27%	145,51	↑ 70%	16,9%	115,89
Total	Total								411 249	317 711	↑ 29%	143 184	116 129	↑ 23%				

Cathegory	Product	Chedraui																
		Price				Quantity			Revenue			Profit					Margin	Con. Price
		Proposed	Original	%	PPK Prop.	Proposed	Original	%	Proposed	Original	%	Proposed	Original	%	Popt	% Util Opt		
Lavandería		11,50	10,90	↑ 6%	28,75	7 555	12 934	↓ -42%	73 411	119 126	↓ -38%	27 947	41 290	↓ -32%	9,54	↓ -15%	15,5%	8,38
Total	Total								73 411	119 126	↓ -38%	27 947	41 290	↓ -32%				

Table 13- Models Results (Total and per Category)

Cathegory	Product	Tons				Revenue				Profit			
		Proposed	Original	%	Impact	Proposed	Original	%	Impact	Proposed	Original	%	Impact
Tocador	CONFIDENTIAL	92	87	5%	5	3 207 463	3 116 167	3%	91 296	1 145 263	1 160 211	-1%	-14 948
		14	8	64%	5	506 428	368 622	37%	137 806	163 828	159 701	3%	4 127
		16	17	-6%	-1	586 444	614 786	-5%	-28 342	213 559	216 069	-1%	-2 510
		5	4	8%	0	170 943	181 642	-6%	-10 699	63 250	82 125	-23%	-18 876
		24	22	9%	2	857 946	827 907	4%	30 039	285 680	303 667	-6%	-17 987
		182	173	5%	9	6 334 098	6 167 422	3%	166 677	2 087 798	2 131 370	-2%	-43 571
		15	11	41%	4	555 023	468 885	18%	86 138	174 208	199 375	-13%	-25 167
		27	28	-3%	-1	966 967	977 474	-1%	-10 507	333 310	324 630	3%	8 680
		2	2	17%	0	77 915	77 438	1%	476	25 881	32 824	-21%	-6 943
		14	14	5%	1	506 030	508 334	0%	-2 303	142 870	161 742	-12%	-18 873
Total	Total	391	366	7%	25	13 769 257	13 308 678	3%	460 579	4 635 647	4 771 715	-3%	-136 068

Cathegory	Product	Tons				Revenue				Profit			
		Proposed	Original	%	Impact	Proposed	Original	%	Impact	Proposed	Original	%	Impact
Detergentes		228	191	19%	37	3 417 491	2 983 877	15%	433 614	1 210 999	1 133 121	7%	77 877
		161	130	24%	31	2 169 214	1 783 019	22%	386 194	728 774	623 700	17%	105 074
Total	Total	389	321	21%	68	5 586 704	4 766 896	17%	819 808	1 939 773	1 756 822	10%	182 951

Cathegory	Product	Tons				Revenue				Profit			
		Proposed	Original	%	Impact	Proposed	Original	%	Impact	Proposed	Original	%	Impact
Lavandería		55	47	17%	8	1 327 699	1 184 135	12%	143 564	512 456	487 339	5%	25 116
		85	92	-9%	-8	1 995 985	2 039 509	-2%	-43 523	724 638	647 929	12%	76 708
	Total	139	139	0%	0	3 323 685	3 223 644	3%	100 041	1 237 093	1 135 269	9%	101 825

Cathegory	Tons				Revenue				Profit			
	Proposed	Original	%	Impact	Proposed	Original	%	Impact	Proposed	Original	%	Impact
Jabón de tocador	391	366	7%	25	13 769 257	13 308 678	3%	460 579	4 635 647	4 771 715	-3%	-136 068
Multiusos	389	321	21%	68	5 586 704	4 766 896	17%	819 808	1 939 773	1 756 822	10%	182 951
Lavandería	139	139	0%	0	3 323 685	3 223 644	3%	100 041	1 237 093	1 135 269	9%	101 825
Total	920	827	11,3%	93	22 679 646	21 299 218	6%	1 380 428	7 812 513	7 663 805	1,9%	148 708

Table 14- Prices per Retail format

Cathegory	SKU	Walmex				Casa Ley			Soriana				Chedraui	
		Bodega	Supercenter	Sams *	Superama	Fiesta Europea	Fiesta Compacta	Compacto Express	Híper	Mercado	Súper	Express	Chedraui	Súper Che
Tocador	CONFIDENTIAL	25,99	26,99		29,99	29,49	29,99		29,89	24,89	29,99	24,99	26,49	27,49
						13,29	13,99		14,89	12,99	15,49		12,89	12,89
			9,69			10,49	10,49	10,39	9,99	9,29	9,99	9,99		
				6,00		8,29	8,29	7,99					7,89	
		4,69	4,69			5,29	5,29	5,29	4,89	4,89			4,69	4,89
		25,99	26,99		29,99	29,49	29,99		29,49	24,49	29,99	24,49	26,89	27,89
						14,19	14,49		14,49	13,99	15,49		12,89	12,89
			9,99			10,49	10,49	10,39	9,99	9,69	9,99	10,19		
				6,46		8,49	8,49	8,49						7,89
		4,69				5,29	5,29	5,29	4,89	4,89				
Detergentes			18,69			17,49	16,99	17,49	18,99		18,89		17,99	18,49
		153,99		140,72		154,99	159,99						154,89	
Lavandería						12,19	12,49							
		12,99	12,49	10,66					12,89	12,89	12,49	11,89	11,49	

Annex D: Scatter Plots Data Series

Table 15 - "sku 1 - Fiesta Compacta" Data Series (1/2)

group	format	SKU	numweek	value	value_vat	units	ppp
Ley	Fiesta Compa	sku 1	201201	6522	7565.52	274	27.6113869
Ley	Fiesta Compa	sku 1	201202	5692	6602.72	239	27.6264435
Ley	Fiesta Compa	sku 1	201203	6162	7147.92	259	27.5981467
Ley	Fiesta Compa	sku 1	201204	4857	5634.12	204	27.6182353
Ley	Fiesta Compa	sku 1	201205	6288	7294.08	264	27.6290909
Ley	Fiesta Compa	sku 1	201206	6228	7224.48	283	25.5281979
Ley	Fiesta Compa	sku 1	201207	12231	14187.96	633	22.4138389
Ley	Fiesta Compa	sku 1	201208	6066	7036.56	255	27.5943529
Ley	Fiesta Compa	sku 1	201209	7323	8494.68	308	27.5801299
Ley	Fiesta Compa	sku 1	201210	5426	6294.16	228	27.6059649
Ley	Fiesta Compa	sku 1	201211	6301	7309.16	265	27.5817358
Ley	Fiesta Compa	sku 1	201212	6411	7436.76	286	26.0026573
Ley	Fiesta Compa	sku 1	201213	6987	8104.92	344	23.560814
Ley	Fiesta Compa	sku 1	201214	7923	9190.68	333	27.5996396
Ley	Fiesta Compa	sku 1	201215	5849	6784.84	244	27.8067213
Ley	Fiesta Compa	sku 1	201216	5598	6493.68	216	30.0633333
Ley	Fiesta Compa	sku 1	201217	5043	5849.88	194	30.1540206
Ley	Fiesta Compa	sku 1	201218	7032	8157.12	271	30.1000738
Ley	Fiesta Compa	sku 1	201219	6596	7651.36	277	27.6222383
Ley	Fiesta Compa	sku 1	201220	14464	16778.24	685	24.493781
Ley	Fiesta Compa	sku 1	201221	5835	6768.6	225	30.0826667
Ley	Fiesta Compa	sku 1	201222	7785	9030.6	300	30.102
Ley	Fiesta Compa	sku 1	201223	6715	7789.4	259	30.0749035
Ley	Fiesta Compa	sku 1	201224	7263	8425.08	280	30.0895714
Ley	Fiesta Compa	sku 1	201225	6972	8087.52	269	30.0651301
Ley	Fiesta Compa	sku 1	201226	6875	7975	265	30.0943396
Ley	Fiesta Compa	sku 1	201227	10639	12341.24	437	28.2408238
Ley	Fiesta Compa	sku 1	201228	12289	14255.24	586	24.3263481
Ley	Fiesta Compa	sku 1	201229	6464	7498.24	249	30.1134137
Ley	Fiesta Compa	sku 1	201230	4334	5027.44	167	30.1044311
Ley	Fiesta Compa	sku 1	201231	8375	9715	323	30.0773994
Ley	Fiesta Compa	sku 1	201232	5765	6687.4	222	30.1234234
Ley	Fiesta Compa	sku 1	201233	7365	8543.4	284	30.0823944
Ley	Fiesta Compa	sku 1	201234	7965	9239.4	327	28.2550459
Ley	Fiesta Compa	sku 1	201235	13916	16142.56	652	24.7585276
Ley	Fiesta Compa	sku 1	201236	7205	8357.8	292	28.6226027
Ley	Fiesta Compa	sku 1	201237	7306	8474.96	296	28.6316216
Ley	Fiesta Compa	sku 1	201238	5876	6816.16	238	28.6393277
Ley	Fiesta Compa	sku 1	201239	8218	9532.88	333	28.6272673
Ley	Fiesta Compa	sku 1	201240	10436	12105.76	438	27.6387215
Ley	Fiesta Compa	sku 1	201241	10412	12077.92	487	24.8006571
Ley	Fiesta Compa	sku 1	201242	7504	8704.64	305	28.5398033
Ley	Fiesta Compa	sku 1	201243	5782	6707.12	239	28.0632636
Ley	Fiesta Compa	sku 1	201244	8523	9886.68	350	28.2476571
Ley	Fiesta Compa	sku 1	201245	6481	7517.96	265	28.3696604
Ley	Fiesta Compa	sku 1	201246	8768	10170.88	358	28.4102793
Ley	Fiesta Compa	sku 1	201247	7236	8393.76	299	28.0727759
Ley	Fiesta Compa	sku 1	201248	8396	9739.36	346	28.1484393
Ley	Fiesta Compa	sku 1	201249	6476	7512.16	268	28.0304478
Ley	Fiesta Compa	sku 1	201250	5574	6465.84	230	28.1123478
Ley	Fiesta Compa	sku 1	201251	8268	9590.88	341	28.1257478
Ley	Fiesta Compa	sku 1	201252	7723	8958.68	350	25.5962286
Ley	Fiesta Compa	sku 1	201301	10363.95	12022.182	563	21.3537869
Ley	Fiesta Compa	sku 1	201302	4884.85	5666.426	218	25.9927798
Ley	Fiesta Compa	sku 1	201303	10323.22	11974.935	523	22.8966256
Ley	Fiesta Compa	sku 1	201304	5537.06	6422.99	228	28.171007
Ley	Fiesta Compa	sku 1	201305	7085.66	8219.366	293	28.0524423
Ley	Fiesta Compa	sku 1	201306	7195.46	8346.734	321	26.0022854
Ley	Fiesta Compa	sku 1	201307	10869.41	12608.516	549	22.9663308
Ley	Fiesta Compa	sku 1	201308	6192.73	7183.567	256	28.0608078
Ley	Fiesta Compa	sku 1	201309	6652.84	7717.294	272	28.3724059
Ley	Fiesta Compa	sku 1	201310	6973.71	8089.504	294	27.5153184
Ley	Fiesta Compa	sku 1	201311	7237.5	8395.5	342	24.5482456
Ley	Fiesta Compa	sku 1	201312	6584.6	7638.136	270	28.2893926

Table 16 - "sku 1 - Fiesta Compacta" Data Series (2/2)

group	format	SKU	numweek	value	value_vat	units	ppp
Ley	Fiesta Compa	sku 1	201313	6102.44	7078.83	249	28.4290378
Ley	Fiesta Compa	sku 1	201314	7630.9	8851.844	310	28.5543355
Ley	Fiesta Compa	sku 1	201315	6248.69	7248.48	256	28.3143766
Ley	Fiesta Compa	sku 1	201316	9128.2	10588.712	390	27.1505436
Ley	Fiesta Compa	sku 1	201317	4722	5477.52	190	28.8290526
Ley	Fiesta Compa	sku 1	201318	8421.39	9768.812	339	28.8165558
Ley	Fiesta Compa	sku 1	201319	6027.3	6991.668	252	27.7447143
Ley	Fiesta Compa	sku 1	201320	8538.62	9904.799	397	24.9491164
Ley	Fiesta Compa	sku 1	201321	4308.84	4998.254	181	27.6146652
Ley	Fiesta Compa	sku 1	201322	7067.25	8198.01	325	25.2246462
Ley	Fiesta Compa	sku 1	201323	5497.17	6376.717	222	28.7239514
Ley	Fiesta Compa	sku 1	201324	5521.13	6404.511	238	26.9097092
Ley	Fiesta Compa	sku 1	201325	8821.95	10233.462	414	24.7185072
Ley	Fiesta Compa	sku 1	201326	4964.87	5759.249	213	27.0387286
Ley	Fiesta Compa	sku 1	201327	8055.67	9344.577	340	27.4840506
Ley	Fiesta Compa	sku 1	201328	9164.55	10630.878	427	24.8966698
Ley	Fiesta Compa	sku 1	201329	7299.89	8467.872	294	28.8022871
Ley	Fiesta Compa	sku 1	201330	5090.03	5904.435	205	28.802121
Ley	Fiesta Compa	sku 1	201331	9497.49	11017.088	383	28.7652439
Ley	Fiesta Compa	sku 1	201332	7347	8522.52	296	28.7922973
Ley	Fiesta Compa	sku 1	201333	7789.3	9035.588	314	28.775758
Ley	Fiesta Compa	sku 1	201334	7285.71	8451.424	303	27.8924871
Ley	Fiesta Compa	sku 1	201335	8616.9	9995.604	400	24.98901
Ley	Fiesta Compa	sku 1	201336	6030.06	6994.87	243	28.7854716
Ley	Fiesta Compa	sku 1	201337	5231.98	6069.097	211	28.7634919
Ley	Fiesta Compa	sku 1	201338	4922.95	5710.622	198	28.8415253
Ley	Fiesta Compa	sku 1	201339	6291.61	7298.268	253	28.8469075
Ley	Fiesta Compa	sku 1	201340	8818.43	10229.379	369	27.7218938
Ley	Fiesta Compa	sku 1	201341	7187.47	8337.465	332	25.112847
Ley	Fiesta Compa	sku 1	201342	6970.63	8085.931	280	28.8783243
Ley	Fiesta Compa	sku 1	201343	5286.13	6131.911	212	28.9241075
Ley	Fiesta Compa	sku 1	201344	8844.55	10259.678	357	28.7385938
Ley	Fiesta Compa	sku 1	201345	8945.35	10376.606	360	28.8239056
Ley	Fiesta Compa	sku 1	201346	8584.28	9957.765	359	27.7375064
Ley	Fiesta Compa	sku 1	201347	7052.95	8181.422	285	28.7067439
Ley	Fiesta Compa	sku 1	201348	7987.66	9265.686	322	28.7754211
Ley	Fiesta Compa	sku 1	201349	8518.82	9881.831	344	28.7262535
Ley	Fiesta Compa	sku 1	201350	7737.13	8975.071	312	28.7662526
Ley	Fiesta Compa	sku 1	201351	9650.37	11194.429	389	28.777453
Ley	Fiesta Compa	sku 1	201352	8090.58	9385.073	325	28.8771471
Ley	Fiesta Compa	sku 1	201401	10978.98	12735.617	443	28.7485707
Ley	Fiesta Compa	sku 1	201402	8332.07	9665.201	335	28.8513469
Ley	Fiesta Compa	sku 1	201403	8868.08	10286.973	358	28.7345609
Ley	Fiesta Compa	sku 1	201404	7483.47	8680.825	301	28.8399508
Ley	Fiesta Compa	sku 1	201405	7554.76	8763.522	304	28.8273737
Ley	Fiesta Compa	sku 1	201406	8878.71	10299.304	357	28.8495899
Ley	Fiesta Compa	sku 1	201407	7495.98	8695.337	302	28.792506
Ley	Fiesta Compa	sku 1	201408	7934.1	9203.556	319	28.8512727
Ley	Fiesta Compa	sku 1	201409	7267.12	8429.859	292	28.8693808
Ley	Fiesta Compa	sku 1	201410	8564.02	9934.263	354	28.0628904
Ley	Fiesta Compa	sku 1	201411	8775.81	10179.94	408	24.9508324
Ley	Fiesta Compa	sku 1	201412	7563.8	8774.008	307	28.5798306
Ley	Fiesta Compa	sku 1	201413	7602.81	8819.26	333	26.4842631
Ley	Fiesta Compa	sku 1	201414	9728.47	11285.025	391	28.861957
Ley	Fiesta Compa	sku 1	201416	14299.99	16587.988	668	24.832318
Ley	Fiesta Compa	sku 1	201417	10227.5	11863.9	478	24.8198745
Ley	Fiesta Compa	sku 1	201418	9781.13	11346.111	393	28.8705109
Ley	Fiesta Compa	sku 1	201419	7567.89	8778.752	313	28.0471323
Ley	Fiesta Compa	sku 1	201421	8203.59	9516.164	340	27.9887188
Ley	Fiesta Compa	sku 1	201422	7737	8975	353	25.4257541
Ley	Fiesta Compa	sku 1	201423	10049	11657	405	28.7835812
Ley	Fiesta Compa	sku 1	201425	7048	8175	328	24.9247927
Ley	Fiesta Compa	sku 1	201426	8103	9400	327	28.7457933
Ley	Fiesta Compa	sku 1	201427	8420	9767	350	27.9049269
Ley	Fiesta Compa	sku 1	201428	7032	8157	316	25.8139646

Table 17 - "sku 2 - Fiesta Compacta" Data Series (1/2)

group	format	SKU	numweek	value	value_vat	units	ppp
Ley	Fiesta Compa	sku 2	201201	42072	48803.52	302	161.60106
Ley	Fiesta Compa	sku 2	201202	31392	36414.72	224	162.565714
Ley	Fiesta Compa	sku 2	201203	36442	42272.72	261	161.964444
Ley	Fiesta Compa	sku 2	201204	30876	35816.16	221	162.064072
Ley	Fiesta Compa	sku 2	201205	36849	42744.84	264	161.912273
Ley	Fiesta Compa	sku 2	201206	38585	44758.6	276	162.168841
Ley	Fiesta Compa	sku 2	201207	35044	40651.04	252	161.313651
Ley	Fiesta Compa	sku 2	201208	35376	41036.16	253	162.198261
Ley	Fiesta Compa	sku 2	201209	40751	47271.16	292	161.887534
Ley	Fiesta Compa	sku 2	201210	34608	40145.28	247	162.531498
Ley	Fiesta Compa	sku 2	201211	32011	37132.76	230	161.446783
Ley	Fiesta Compa	sku 2	201212	33241	38559.56	238	162.014958
Ley	Fiesta Compa	sku 2	201213	38143	44245.88	273	162.072821
Ley	Fiesta Compa	sku 2	201214	37224	43179.84	267	161.722247
Ley	Fiesta Compa	sku 2	201215	41979	48695.64	299	162.861672
Ley	Fiesta Compa	sku 2	201216	29016	33658.56	189	178.087619
Ley	Fiesta Compa	sku 2	201217	28645	33228.2	186	178.646237
Ley	Fiesta Compa	sku 2	201218	34003	39443.48	221	178.477285
Ley	Fiesta Compa	sku 2	201219	23397	27140.52	152	178.556053
Ley	Fiesta Compa	sku 2	201220	29860	34637.6	195	177.628718
Ley	Fiesta Compa	sku 2	201221	26101	30277.16	170	178.100941
Ley	Fiesta Compa	sku 2	201222	33410	38755.6	217	178.597235
Ley	Fiesta Compa	sku 2	201223	32432	37621.12	211	178.299147
Ley	Fiesta Compa	sku 2	201224	28123	32622.68	184	177.297174
Ley	Fiesta Compa	sku 2	201225	27426	31814.16	180	176.745333
Ley	Fiesta Compa	sku 2	201226	25843	29977.88	170	176.340471
Ley	Fiesta Compa	sku 2	201227	42534	49339.44	281	175.585196
Ley	Fiesta Compa	sku 2	201228	26310	30519.6	172	177.439535
Ley	Fiesta Compa	sku 2	201229	22781	26425.96	150	176.173067
Ley	Fiesta Compa	sku 2	201230	23524	27287.84	155	176.050581
Ley	Fiesta Compa	sku 2	201231	27195	31546.2	180	175.256667
Ley	Fiesta Compa	sku 2	201232	22776	26420.16	151	174.967947
Ley	Fiesta Compa	sku 2	201233	27795	32242.2	184	175.229348
Ley	Fiesta Compa	sku 2	201234	24241	28119.56	165	170.421576
Ley	Fiesta Compa	sku 2	201235	30429	35297.64	214	164.942243
Ley	Fiesta Compa	sku 2	201236	29692	34442.72	209	164.797703
Ley	Fiesta Compa	sku 2	201237	33374	38713.84	234	165.443761
Ley	Fiesta Compa	sku 2	201238	26287	30492.92	185	164.826595
Ley	Fiesta Compa	sku 2	201239	33146	38449.36	232	165.73
Ley	Fiesta Compa	sku 2	201240	31780	36864.8	224	164.575
Ley	Fiesta Compa	sku 2	201241	27587	32000.92	194	164.953196
Ley	Fiesta Compa	sku 2	201242	29449	34160.84	207	165.028213
Ley	Fiesta Compa	sku 2	201243	26694	30965.04	188	164.70766
Ley	Fiesta Compa	sku 2	201244	47025	54549	336	162.348214
Ley	Fiesta Compa	sku 2	201245	44352	51448.32	328	156.854634
Ley	Fiesta Compa	sku 2	201246	40539	47025.24	286	164.423916
Ley	Fiesta Compa	sku 2	201247	28223	32738.68	201	162.879005
Ley	Fiesta Compa	sku 2	201248	34639	40181.24	259	155.139923
Ley	Fiesta Compa	sku 2	201249	34998	40597.68	249	163.042892
Ley	Fiesta Compa	sku 2	201250	50647	58750.52	380	154.606632
Ley	Fiesta Compa	sku 2	201251	49443	57353.88	352	162.937159
Ley	Fiesta Compa	sku 2	201252	44121	51180.36	313	163.515527
Ley	Fiesta Compa	sku 2	201301	21133.28	24514.605	149	164.527549
Ley	Fiesta Compa	sku 2	201302	22392.68	25975.509	159	163.36798
Ley	Fiesta Compa	sku 2	201303	28291.96	32818.674	209	157.027146
Ley	Fiesta Compa	sku 2	201304	30093.25	34908.17	219	159.398037
Ley	Fiesta Compa	sku 2	201305	37628.29	43648.816	279	156.447371
Ley	Fiesta Compa	sku 2	201306	35908.06	41653.35	261	159.591378
Ley	Fiesta Compa	sku 2	201307	31840.68	36935.189	229	161.289034
Ley	Fiesta Compa	sku 2	201308	39455.54	45768.426	297	154.102446
Ley	Fiesta Compa	sku 2	201309	43236.3	50154.108	324	154.79663
Ley	Fiesta Compa	sku 2	201310	43264.42	50186.727	323	155.376864
Ley	Fiesta Compa	sku 2	201311	40882.15	47423.294	304	155.997678
Ley	Fiesta Compa	sku 2	201312	33467.92	38822.787	240	161.761613

Table 18 - "sku 2 - Fiesta Compacta" Data Series (2/2)

group	format	SKU	numweek	value	value_vat	units	ppp
Ley	Fiesta Compa	sku 2	201313	39702.34	46054.714	295	156.117676
Ley	Fiesta Compa	sku 2	201314	39369.24	45668.318	282	161.944391
Ley	Fiesta Compa	sku 2	201315	37804.41	43853.116	280	156.61827
Ley	Fiesta Compa	sku 2	201316	44469.71	51584.864	317	162.728276
Ley	Fiesta Compa	sku 2	201317	31360.27	36377.913	223	163.129656
Ley	Fiesta Compa	sku 2	201318	43136.1	50037.876	307	162.989824
Ley	Fiesta Compa	sku 2	201319	32421.76	37609.242	232	162.1088
Ley	Fiesta Compa	sku 2	201320	53283.37	61808.709	392	157.675279
Ley	Fiesta Compa	sku 2	201321	49137.64	56999.662	365	156.163459
Ley	Fiesta Compa	sku 2	201322	59125.46	68585.534	438	156.587976
Ley	Fiesta Compa	sku 2	201323	47237.74	54795.778	334	164.059217
Ley	Fiesta Compa	sku 2	201324	34425.46	39933.534	255	156.602093
Ley	Fiesta Compa	sku 2	201325	41379.56	48000.29	309	155.340743
Ley	Fiesta Compa	sku 2	201326	46655.91	54120.856	335	161.554793
Ley	Fiesta Compa	sku 2	201327	49702.39	57654.772	356	161.951608
Ley	Fiesta Compa	sku 2	201328	35431.64	41100.702	251	163.747818
Ley	Fiesta Compa	sku 2	201329	12747.32	14786.891	93	158.99883
Ley	Fiesta Compa	sku 2	201330	20577.13	23869.471	147	162.377352
Ley	Fiesta Compa	sku 2	201331	38943.78	45174.785	276	163.676757
Ley	Fiesta Compa	sku 2	201332	39166.86	45433.558	280	162.262706
Ley	Fiesta Compa	sku 2	201333	34396.71	39900.184	246	162.195868
Ley	Fiesta Compa	sku 2	201334	33023.65	38307.434	235	163.010357
Ley	Fiesta Compa	sku 2	201335	36927.92	42836.387	264	162.259042
Ley	Fiesta Compa	sku 2	201336	37047.8	42975.448	264	162.785788
Ley	Fiesta Compa	sku 2	201337	28862.1	33480.036	205	163.317249
Ley	Fiesta Compa	sku 2	201338	26928.36	31236.898	192	162.692175
Ley	Fiesta Compa	sku 2	201339	39625.07	45965.081	285	161.280987
Ley	Fiesta Compa	sku 2	201340	51071.72	59243.195	386	153.47978
Ley	Fiesta Compa	sku 2	201341	26326.74	30539.018	188	162.441587
Ley	Fiesta Compa	sku 2	201342	43570.38	50541.641	328	154.090368
Ley	Fiesta Compa	sku 2	201343	35146.26	40769.662	252	161.784371
Ley	Fiesta Compa	sku 2	201344	54555.67	63284.577	423	149.60893
Ley	Fiesta Compa	sku 2	201345	55586.39	64480.212	413	156.126422
Ley	Fiesta Compa	sku 2	201346	48028.93	55713.559	345	161.488576
Ley	Fiesta Compa	sku 2	201347	32024.07	37147.921	229	162.217997
Ley	Fiesta Compa	sku 2	201348	27935.81	32405.54	202	160.423463
Ley	Fiesta Compa	sku 2	201349	41273.7	47877.492	297	161.203677
Ley	Fiesta Compa	sku 2	201350	49054.78	56903.545	369	154.210149
Ley	Fiesta Compa	sku 2	201351	61908.32	71813.651	444	161.742458
Ley	Fiesta Compa	sku 2	201352	55335.06	64188.67	401	160.071495
Ley	Fiesta Compa	sku 2	201401	40461.05	46934.818	302	155.413305
Ley	Fiesta Compa	sku 2	201402	39846.68	46222.149	281	164.491633
Ley	Fiesta Compa	sku 2	201403	35719.1	41434.156	255	162.486886
Ley	Fiesta Compa	sku 2	201404	29283.21	33968.524	214	158.731419
Ley	Fiesta Compa	sku 2	201405	32083.33	37216.663	230	161.811577
Ley	Fiesta Compa	sku 2	201406	34904.39	40489.092	255	158.780755
Ley	Fiesta Compa	sku 2	201407	9678.83	11227.443	67	167.573773
Ley	Fiesta Compa	sku 2	201408	30183.02	35012.303	214	163.608893
Ley	Fiesta Compa	sku 2	201409	36635.44	42497.11	266	159.763573
Ley	Fiesta Compa	sku 2	201410	44906.81	52091.9	342	152.315496
Ley	Fiesta Compa	sku 2	201411	32015.75	37138.27	243	152.832387
Ley	Fiesta Compa	sku 2	201412	45565.65	52856.154	400	132.140385
Ley	Fiesta Compa	sku 2	201413	42660.95	49486.702	324	152.736735
Ley	Fiesta Compa	sku 2	201414	56664.49	65730.808	439	149.728493
Ley	Fiesta Compa	sku 2	201416	42936	49805.76	304	163.834737
Ley	Fiesta Compa	sku 2	201417	28721.19	33316.58	209	159.409476
Ley	Fiesta Compa	sku 2	201418	56519.98	65563.177	423	154.99569
Ley	Fiesta Compa	sku 2	201419	35009.28	40610.765	251	161.795876
Ley	Fiesta Compa	sku 2	201421	43650.44	50634.51	328	154.373507
Ley	Fiesta Compa	sku 2	201422	40198	46630	303	153.892989
Ley	Fiesta Compa	sku 2	201423	33517	38880	239	162.67641
Ley	Fiesta Compa	sku 2	201425	57735	66973	438	152.905453
Ley	Fiesta Compa	sku 2	201426	35688	41398	256	161.71125
Ley	Fiesta Compa	sku 2	201427	41246	47845	295	162.187386
Ley	Fiesta Compa	sku 2	201428	29178	33847	211	160.410353

Table 19 - "sku 2 – Walmex Bodega" Data Series

Walmex	Bodega	sku 2	201313	71278.26	82682.782	513	161.175013
Walmex	Bodega	sku 2	201314	295795.18	343122.409	2121	161.773884
Walmex	Bodega	sku 2	201315	250792.93	290919.799	1795	162.072311
Walmex	Bodega	sku 2	201316	261734.81	303612.38	1875	161.926602
Walmex	Bodega	sku 2	201317	242831.79	281684.876	1740	161.88786
Walmex	Bodega	sku 2	201318	305567.56	354458.37	2195	161.484451
Walmex	Bodega	sku 2	201319	248029.66	287714.406	1775	162.092623
Walmex	Bodega	sku 2	201320	323437.58	375187.593	2308	162.559616
Walmex	Bodega	sku 2	201321	263266.52	305389.163	1884	162.096159
Walmex	Bodega	sku 2	201322	318687.92	369677.987	2276	162.424423
Walmex	Bodega	sku 2	201323	277438.68	321828.869	1987	161.967221
Walmex	Bodega	sku 2	201324	277974.34	322450.234	1987	162.279937
Walmex	Bodega	sku 2	201325	261496.24	303335.638	1864	162.733712
Walmex	Bodega	sku 2	201326	300658.96	348764.394	2149	162.291481
Walmex	Bodega	sku 2	201327	287349.74	333325.698	2045	162.995452
Walmex	Bodega	sku 2	201328	269997.25	313196.81	1927	162.530778
Walmex	Bodega	sku 2	201329	270930.49	314279.368	1937	162.250577
Walmex	Bodega	sku 2	201330	274936.15	318925.934	1969	161.973557
Walmex	Bodega	sku 2	201331	323447.72	375199.355	2314	162.143196
Walmex	Bodega	sku 2	201332	267727.22	310563.575	1916	162.089549
Walmex	Bodega	sku 2	201333	297168.7	344715.692	2169	158.928396
Walmex	Bodega	sku 2	201334	265639.25	308141.53	1899	162.265155
Walmex	Bodega	sku 2	201335	282216.81	327371.5	2020	162.065099
Walmex	Bodega	sku 2	201336	257725.15	298961.174	1850	161.600635
Walmex	Bodega	sku 2	201337	260488.07	302166.161	1866	161.932562
Walmex	Bodega	sku 2	201338	278330.58	322863.473	1990	162.242951
Walmex	Bodega	sku 2	201339	283295.29	328622.536	2029	161.962807
Walmex	Bodega	sku 2	201340	305901.87	354846.169	2186	162.326701
Walmex	Bodega	sku 2	201341	255586.51	296480.352	1832	161.834253
Walmex	Bodega	sku 2	201342	282567.37	327778.149	2024	161.945726
Walmex	Bodega	sku 2	201343	238685.52	276875.203	1710	161.915324
Walmex	Bodega	sku 2	201344	289565.07	335895.481	2075	161.87734
Walmex	Bodega	sku 2	201345	263680.83	305869.763	1887	162.093144
Walmex	Bodega	sku 2	201346	304675.74	353423.858	2179	162.195438
Walmex	Bodega	sku 2	201347	270031.72	313236.795	1932	162.130846
Walmex	Bodega	sku 2	201348	306203.09	355195.584	2192	162.041781
Walmex	Bodega	sku 2	201349	292486.58	339284.433	2097	161.795152
Walmex	Bodega	sku 2	201350	333749.81	387149.78	2392	161.851915
Walmex	Bodega	sku 2	201351	410242.88	475881.741	2936	162.085062
Walmex	Bodega	sku 2	201352	372788.8	432435.008	2668	162.082087
Walmex	Bodega	sku 2	201401	372915	432581.4	2678	161.531516
Walmex	Bodega	sku 2	201402	349724.23	405680.107	2515	161.304217
Walmex	Bodega	sku 2	201403	351151.37	407335.589	2523	161.448906
Walmex	Bodega	sku 2	201404	296384.06	343805.51	2133	161.184018
Walmex	Bodega	sku 2	201405	339279.14	393563.802	2444	161.032652
Walmex	Bodega	sku 2	201406	325897.41	378040.996	2343	161.349123
Walmex	Bodega	sku 2	201407	325522.1	377605.636	2344	161.094555
Walmex	Bodega	sku 2	201408	279269.06	323952.11	2012	161.009995
Walmex	Bodega	sku 2	201409	321593.61	373048.588	2315	161.144098
Walmex	Bodega	sku 2	201410	344911.98	400097.897	2478	161.460007
Walmex	Bodega	sku 2	201411	290479.41	336956.116	2085	161.609648
Walmex	Bodega	sku 2	201412	258091.14	299385.722	1855	161.39392
Walmex	Bodega	sku 2	201413	307079.34	356212.034	2205	161.547408
Walmex	Bodega	sku 2	201414	362546.79	420554.276	2605	161.441181
Walmex	Bodega	sku 2	201415	309521.99	359045.508	2222	161.586637
Walmex	Bodega	sku 2	201416	370668.89	429975.912	2664	161.40237
Walmex	Bodega	sku 2	201417	378849.7	439465.652	2719	161.627676
Walmex	Bodega	sku 2	201418	395904.19	459248.86	2838	161.821304
Walmex	Bodega	sku 2	201419	342209.64	396963.182	2459	161.43277
Walmex	Bodega	sku 2	201420	421296.44	488703.87	3025	161.554998
Walmex	Bodega	sku 2	201421	335098.77	388714.573	2406	161.560504
Walmex	Bodega	sku 2	201422	420889.96	488232.354	3022	161.559349
Walmex	Bodega	sku 2	201423	395301.39	458549.612	2837	161.631869
Walmex	Bodega	sku 2	201424	382508.73	443710.127	2747	161.525346
Walmex	Bodega	sku 2	201425	335804	389532.64	2414	161.363977
Walmex	Bodega	sku 2	201426	343586.32	398560.131	2466	161.622113
Walmex	Bodega	sku 2	201427	410161.11	475786.888	2950	161.283691
Walmex	Bodega	sku 2	201428	334739.38	388297.681	2415	160.785789
Walmex	Bodega	sku 2	201429	434047.74	503495.378	3115	161.635756
Walmex	Bodega	sku 2	201430	217910.65	252776.354	1568	161.209409

Table 20 - "sku 3 – Walmex Supercenter" Data Series

Walmex	Supercenter	sku 3	201313	37784.48	43829.997	3786	11.5768613
Walmex	Supercenter	sku 3	201314	150918.61	175065.588	15187	11.5273318
Walmex	Supercenter	sku 3	201315	137768.46	159811.414	13778	11.5990284
Walmex	Supercenter	sku 3	201316	132434.87	153624.449	13378	11.4833644
Walmex	Supercenter	sku 3	201317	118056.09	136945.064	12162	11.2600777
Walmex	Supercenter	sku 3	201318	157063.3	182193.428	16249	11.2125933
Walmex	Supercenter	sku 3	201319	124893.69	144876.68	12801	11.3176065
Walmex	Supercenter	sku 3	201320	157026.3	182150.508	15885	11.4668246
Walmex	Supercenter	sku 3	201321	129292.3	149979.068	13074	11.4715518
Walmex	Supercenter	sku 3	201322	160268.4	185911.344	16512	11.2591657
Walmex	Supercenter	sku 3	201323	150962.1	175116.036	15512	11.2890688
Walmex	Supercenter	sku 3	201324	143383.74	166325.138	14839	11.2086487
Walmex	Supercenter	sku 3	201325	137337	159310.92	14024	11.3598774
Walmex	Supercenter	sku 3	201326	145213.81	168448.02	14868	11.3295682
Walmex	Supercenter	sku 3	201327	141938.1	164648.196	14655	11.2349503
Walmex	Supercenter	sku 3	201328	127814.54	148264.866	13220	11.2151941
Walmex	Supercenter	sku 3	201329	128948.97	149580.805	13432	11.1361529
Walmex	Supercenter	sku 3	201330	111871.99	129771.508	11618	11.1698664
Walmex	Supercenter	sku 3	201331	158015.82	183298.351	16455	11.1393711
Walmex	Supercenter	sku 3	201332	142816.75	165667.43	14783	11.2066177
Walmex	Supercenter	sku 3	201333	156885.28	181986.925	16341	11.1368291
Walmex	Supercenter	sku 3	201334	133268.62	154591.599	13974	11.0628023
Walmex	Supercenter	sku 3	201335	163962.41	190196.396	17048	11.1565225
Walmex	Supercenter	sku 3	201336	152889.56	177351.89	15829	11.2042384
Walmex	Supercenter	sku 3	201337	133167.97	154474.845	13805	11.1897751
Walmex	Supercenter	sku 3	201338	141711.4	164385.224	14650	11.2208344
Walmex	Supercenter	sku 3	201339	138638.63	160820.811	14435	11.141033
Walmex	Supercenter	sku 3	201340	168572.37	195543.949	17624	11.0953217
Walmex	Supercenter	sku 3	201341	139367.93	161666.799	14474	11.1694624
Walmex	Supercenter	sku 3	201342	147338.63	170912.811	15301	11.1700419
Walmex	Supercenter	sku 3	201343	120730.48	140047.357	12275	11.4091533
Walmex	Supercenter	sku 3	201344	156894.1	181997.156	16282	11.1778133
Walmex	Supercenter	sku 3	201345	147058.74	170588.138	15103	11.2949837
Walmex	Supercenter	sku 3	201346	149777.58	173741.993	15545	11.1767123
Walmex	Supercenter	sku 3	201347	138309.99	160439.588	14296	11.2226909
Walmex	Supercenter	sku 3	201348	144928.5	168117.06	15031	11.184689
Walmex	Supercenter	sku 3	201349	144413.54	167519.706	14988	11.176922
Walmex	Supercenter	sku 3	201350	142977.08	165853.413	14764	11.2336367
Walmex	Supercenter	sku 3	201351	146882.69	170383.92	14263	11.9458684
Walmex	Supercenter	sku 3	201352	117387	136168.92	11352	11.995148
Walmex	Supercenter	sku 3	201401	146360.41	169778.076	14178	11.9747549
Walmex	Supercenter	sku 3	201402	139446.1	161757.476	13873	11.6598772
Walmex	Supercenter	sku 3	201403	141481.94	164119.05	14632	11.2164469
Walmex	Supercenter	sku 3	201404	120156.87	139381.969	12526	11.1274125
Walmex	Supercenter	sku 3	201405	135622.36	157321.938	14082	11.1718462
Walmex	Supercenter	sku 3	201406	141789.35	164475.646	14675	11.2078805
Walmex	Supercenter	sku 3	201407	130083.17	150896.477	13515	11.1651112
Walmex	Supercenter	sku 3	201408	120351.63	139607.891	12484	11.1829454
Walmex	Supercenter	sku 3	201409	139226.66	161502.926	14183	11.3870779
Walmex	Supercenter	sku 3	201410	128174.9	148682.884	12871	11.5517741
Walmex	Supercenter	sku 3	201411	113353.59	131490.164	11707	11.2317557
Walmex	Supercenter	sku 3	201412	122240.51	141798.992	12630	11.2271569
Walmex	Supercenter	sku 3	201413	128994.97	149634.165	13327	11.2278956
Walmex	Supercenter	sku 3	201414	147490.79	171089.316	15229	11.2344419
Walmex	Supercenter	sku 3	201415	114875.19	133255.22	11819	11.2746612
Walmex	Supercenter	sku 3	201416	125280.06	145324.87	12902	11.2637475
Walmex	Supercenter	sku 3	201417	119883.56	139064.93	12168	11.4287417
Walmex	Supercenter	sku 3	201418	149493.84	173412.854	15206	11.4042387
Walmex	Supercenter	sku 3	201419	113457.5	131610.7	11471	11.4733415
Walmex	Supercenter	sku 3	201420	136115.6	157894.096	13892	11.365829
Walmex	Supercenter	sku 3	201421	115391.03	133853.595	11721	11.4199808
Walmex	Supercenter	sku 3	201422	146642.61	170105.428	14852	11.4533684
Walmex	Supercenter	sku 3	201423	142265.89	165028.432	14346	11.5034457
Walmex	Supercenter	sku 3	201424	122684.27	142313.753	12404	11.4732145
Walmex	Supercenter	sku 3	201425	125456.36	145529.378	12675	11.4816077
Walmex	Supercenter	sku 3	201426	119800.65	138968.754	12100	11.485021
Walmex	Supercenter	sku 3	201427	146404.61	169829.348	14784	11.4873747
Walmex	Supercenter	sku 3	201428	112444.67	130435.817	11248	11.5963564
Walmex	Supercenter	sku 3	201429	130389.28	151251.565	12990	11.6436924
Walmex	Supercenter	sku 3	201430	63001.06	73081.23	6276	11.6445554

Annex E: “sku x” Data Series

Table 21 – “sku x” data series from Soriana-Hiper

numweek	group	format	q sku x	ppp sku x	Comp Y
201342	Soriana	Hiper	1101	27.13	29.08
201343	Soriana	Hiper	1328	26.78	28.49
201344	Soriana	Hiper	1687	26.11	26.96
201345	Soriana	Hiper	1418	26.43	26.03
201346	Soriana	Hiper	1550	25.05	25.39
201347	Soriana	Hiper	1592	26.55	29.04
201348	Soriana	Hiper	1624	26.11	26.39
201349	Soriana	Hiper	1477	26.27	26.27
201350	Soriana	Hiper	1879	25.51	29.14
201351	Soriana	Hiper	1706	26.22	34.96
201352	Soriana	Hiper	1321	27.81	35.20
201401	Soriana	Hiper	1516	27.93	35.17
201402	Soriana	Hiper	1361	27.95	34.87
201403	Soriana	Hiper	1518	27.67	32.31
201404	Soriana	Hiper	1162	27.50	25.75
201405	Soriana	Hiper	1120	27.32	26.20
201406	Soriana	Hiper	1329	26.91	32.68
201407	Soriana	Hiper	1397	26.53	27.57
201408	Soriana	Hiper	1302	26.32	26.19
201409	Soriana	Hiper	1611	26.02	27.52
201410	Soriana	Hiper	1518	25.69	28.63
201411	Soriana	Hiper	1503	25.15	28.29
201412	Soriana	Hiper	1513	25.23	28.90
201413	Soriana	Hiper	1444	25.44	30.20
201414	Soriana	Hiper	1763	25.46	30.39
201415	Soriana	Hiper	1401	25.34	26.05
201416	Soriana	Hiper	1655	25.14	29.35
201417	Soriana	Hiper	1442	25.17	26.83
201418	Soriana	Hiper	2248	25.00	29.82
201419	Soriana	Hiper	2095	24.13	27.02
201420	Soriana	Hiper	2490	24.70	26.85
201421	Soriana	Hiper	1997	24.88	30.87
201422	Soriana	Hiper	2818	24.29	31.03
201423	Soriana	Hiper	2592	24.84	31.31
201424	Soriana	Hiper	2859	22.75	28.26
201425	Soriana	Hiper	1681	26.61	34.09
201426	Soriana	Hiper	2140	24.89	35.51